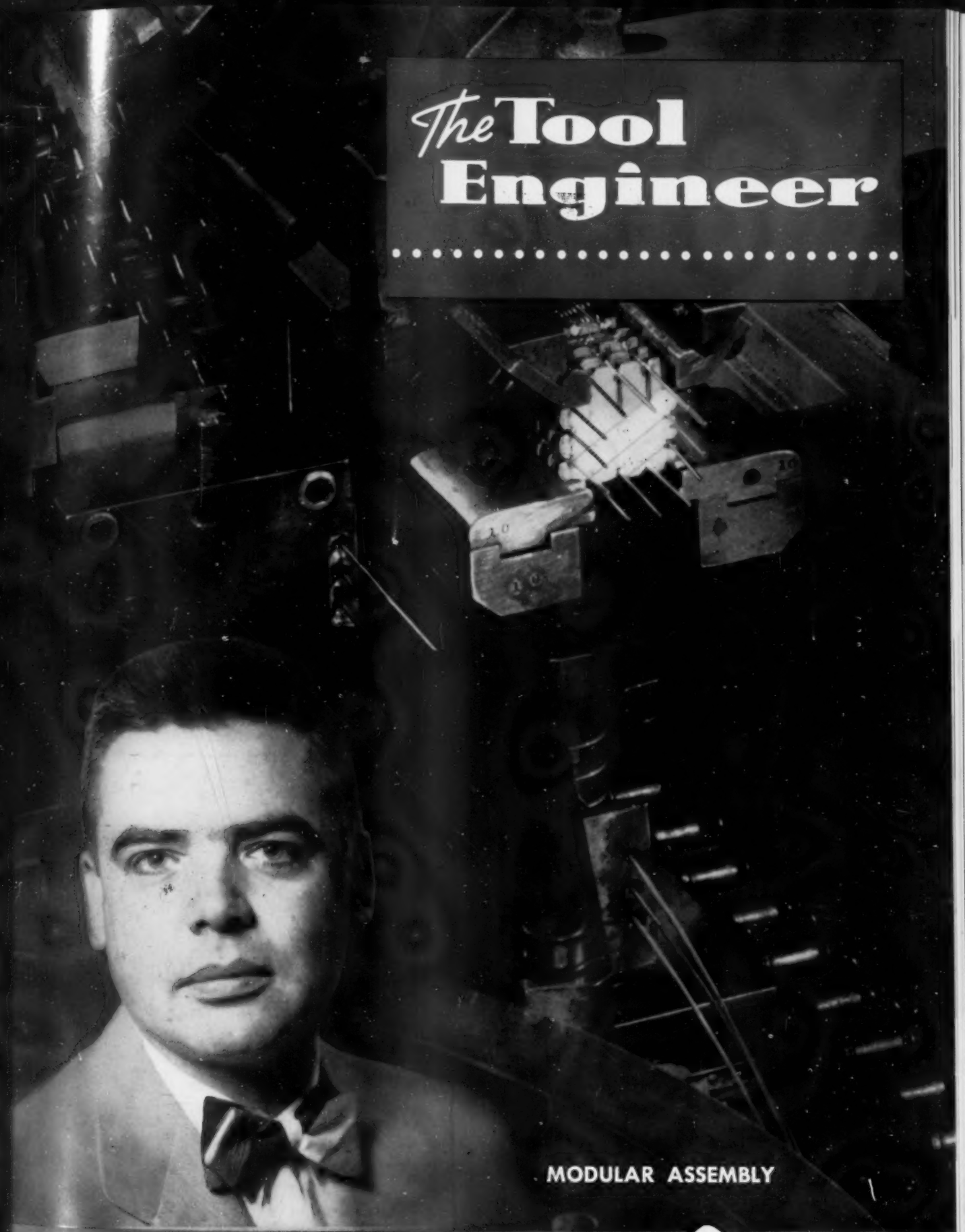
The Tool Engineer

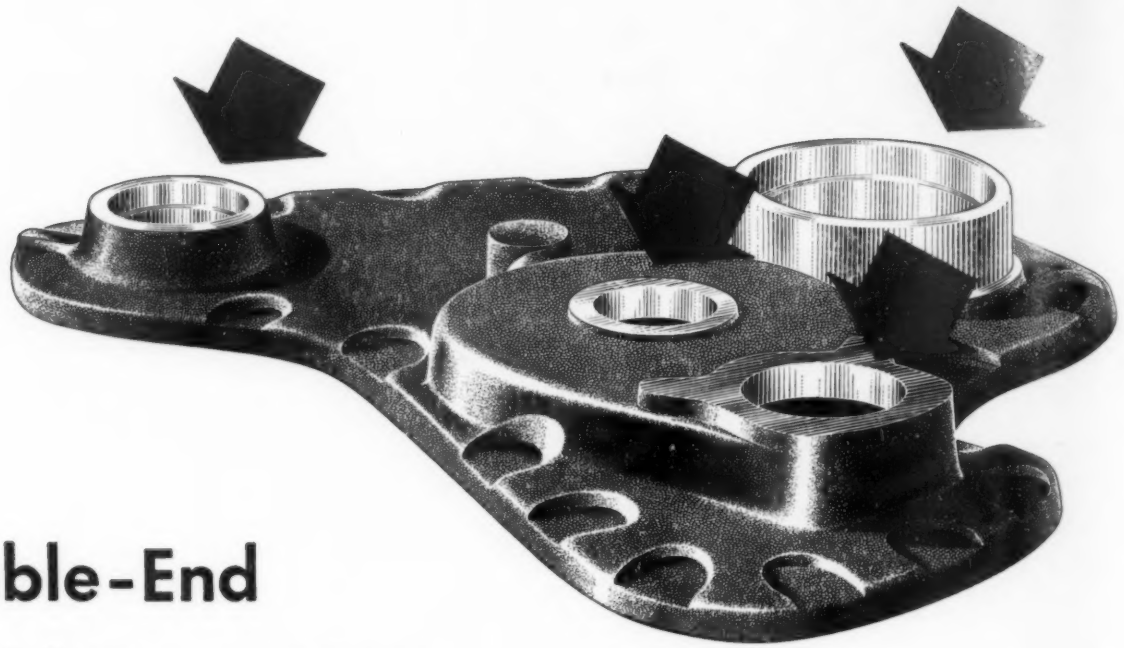


MODULAR ASSEMBLY

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

DECEMBER, 1953

PLANNING ENGINEERING CONTROL OF TOOLING EQUIPMENT PRODUCTION



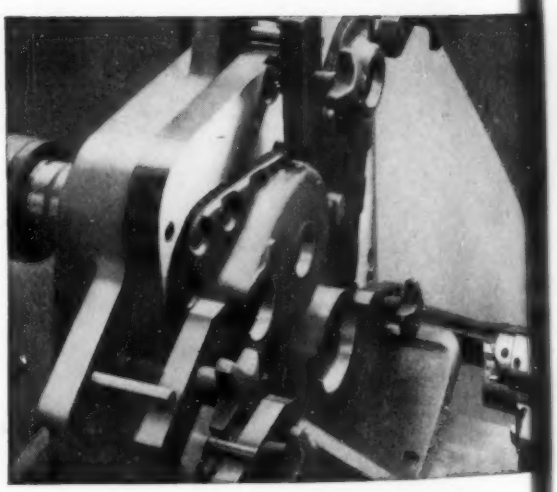
Double-End Heald Bore-Matic does a 5-HOUR JOB

in 12 MINUTES

● Precision finishing the four bearing holes in this gear case cover used to be a 5-hour job — requiring separate operations on different machines. But now it's done in *12 minutes flat* — on a single Heald Model 322 Bore-Matic. That's a saving of 4 hours and 48 minutes per part!

All operations, including boring, facing, chamfering and turning, are performed at a single loading, in one high-speed automatic cycle. Four boringheads are used — one on the left-hand bridge and three on the right. The work is automatically presented to the two sets of heads in sequence, after which it returns to center for reloading.

Remember — when it comes to precision finishing, it pays to come to Heald.



Internal and Rotary Surface Grinding Machines and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

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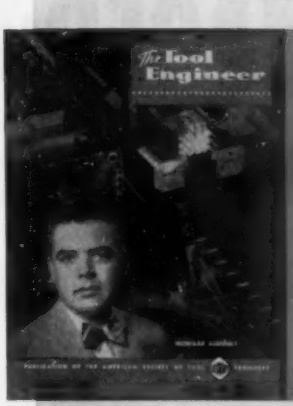
Cover: Work station in machine for automatic assemby of electronic components and their circuits into modules. Features of this remarkable machine and the systems employed in this novel method of making electronic equipment are discussed in the article beginning on page 71.



The Tool Engineer

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AMERICAN SOCIETY OF TOOL ENGINEERS

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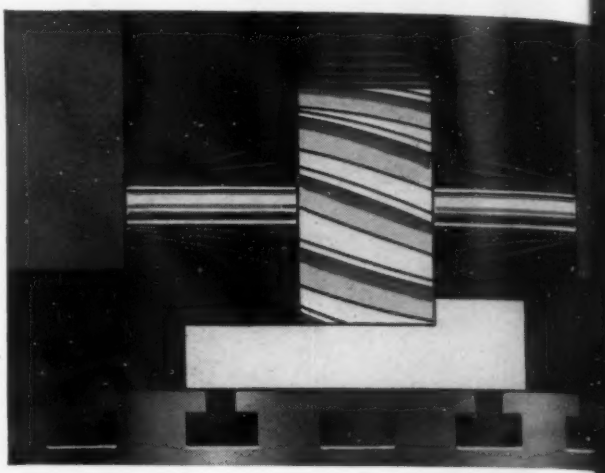
OFFICE OF PUBLICATION: 239 E. Chicago St., Milwaukee, Wis.
EXECUTIVE AND EDITORIAL OFFICES: 10700 Puritan Ave., Detroit 21, Michigan.

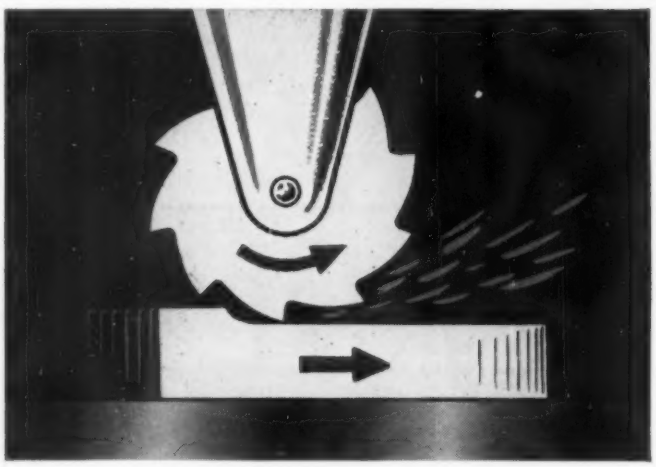
HOW TO END DAMAGED WAYS, PRODUCTION LOSSES

Sunoco Way Lubricant Stops "Jumpy Table"

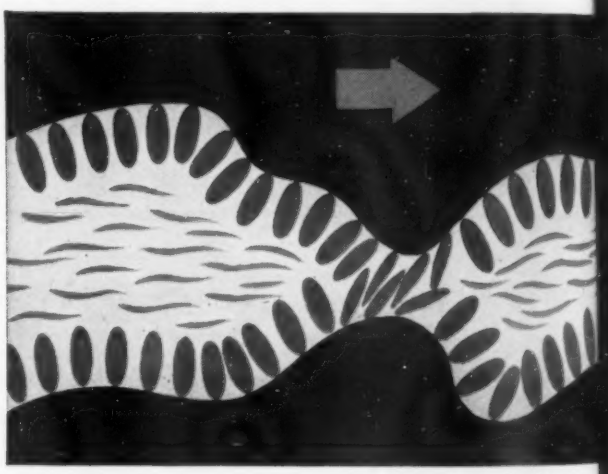
Tool chatter and jumpy table are machining headaches. Too often they cause poor surface finish, failure to hold tolerances, production losses.



Tool chatter is a result of a lack of rigidity in either the machine or the set-up. It is a mechanical problem and no lubricant can lick it.



Jumpy table is a stick . . . slip . . . stick . . . slip action of the table. It is a lubrication problem. Though just as damaging as tool chatter, it is not always detected when the cause of poor surface finishes.



Extreme magnification

Sunoco Way Lubricant cures jumpy table. It contains special compounds that form a film, like the nap of a rug, on the sliding surfaces and minimize the force of both static and kinetic friction.

Why take a chance of damaging your ways? These integral parts of the base casting for your machine are difficult to refinish and costly to replace. For information about Sunoco Way Lubricant, call a Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. TE-12.

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Publication of The American Society of Tool Engineers
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The Tool Engineer

Providing for Changes

In a desire to eliminate manual operations from production, tool engineers are apt to overlook or fail to give sufficient consideration to provisions for model changes. When analyzing the economics of a tooling program, the engineer must investigate not only the quantity lots involved but also the possibility of model changes and their frequency.

If changes may be frequent, he must provide flexibility in his process and methods. Unless production changes can be made readily at low cost, the operation will prove uneconomical. Many unfortunate experiences have proved this to be true. For instance, the adoption of automotive production line techniques has been disastrous to plants requiring frequent changeovers.

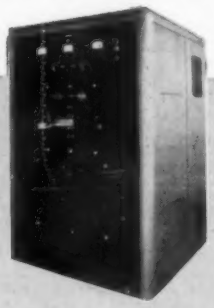
Another historical example is the "pushbutton" factory for radios invented and perfected by Mr. Sargrove in England. Raw materials supplied to a machine emerged from it in the form of complete radio sets. Nevertheless, the factory failed to be practical because it could make only one fixed type of set. The slightest model change involved a six-month shutdown to make new dies and the necessary modifications in the machine.

Combining the lessons learned from Mr. Sargrove's experience together with advanced techniques in printed circuitory and the principles of automation, Robert Henry of The National Bureau of Standards developed production and modular assembly methods for electronic circuits which are discussed in the article beginning on page 71. At final assembly, any combination of parts within the physical capacity of the machines developed by "Project Tinkertoy" can be assembled. Model changes have little effect upon the productivity of the plant.

John W Greve

EDITOR

DEPT. OF DEFENSE work . . . by *LINDBERG* Induction Heating Units



L. A. Young Spring & Wire Corp., Detroit, Mich., use two 5 KW Lindberg Induction Heating Units for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting requirements.

We can't tell you much about the manufacturing processes at the L. A. Young plant (due to security restrictions) . . . but we can tell you about the many rugged construction features of this equipment . . . features which make it so dependable that the L. A. Young organization selected Lindberg Induction Heating Units for their important Department of Defense work. These points of design and construction will minimize costly breakdowns and aggravating work stoppages:

Filament voltage regulation transformers keep tube filament voltages at proper values regardless of line fluctuations. The end result . . . longer tube life.

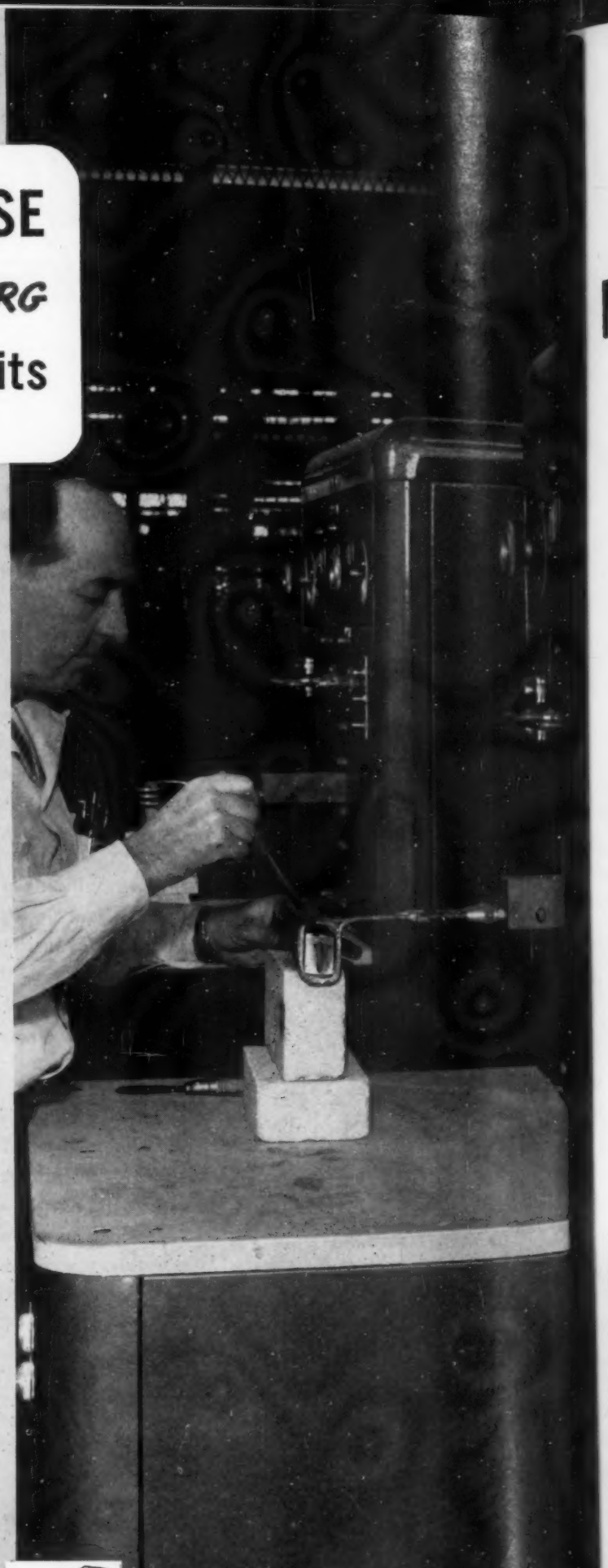
Checklites . . . A system of indicating lamps instantly reveals any abnormal operating conditions . . . simplifies servicing.

Work coil burn-out protection . . . An electrical interlock system makes it impossible to turn on power when cooling water is not flowing.

Long-life industrial tubes feature shortened internal structure . . . Kovar metal-to-glass Seals . . . heavy walled anodes.

Sealed tank capacitors are hermetically sealed against dirt and dust . . . require no servicing or refilling.

Investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.



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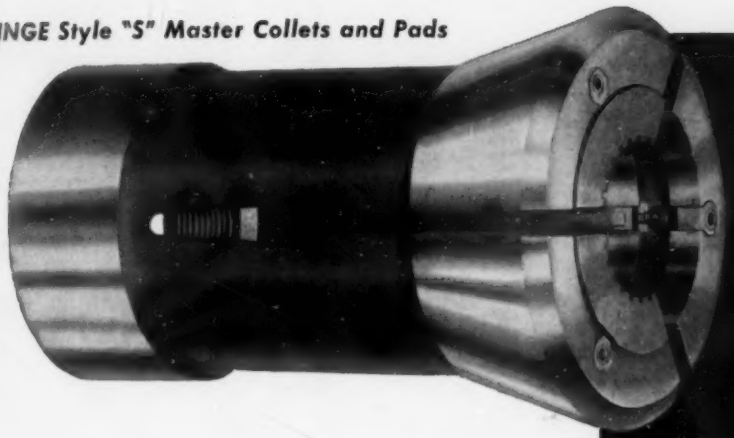
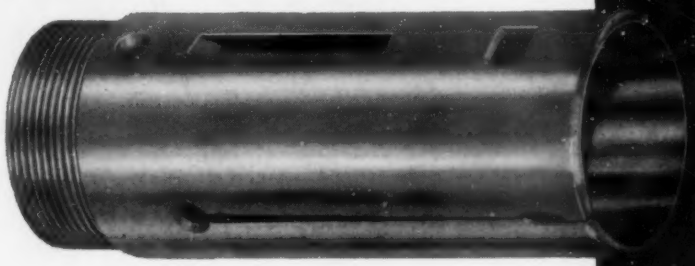
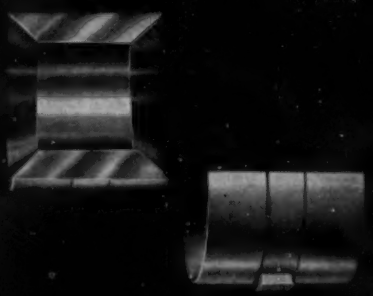


The Only MASTER COLLET
With No Work Pressure
on the Screw.

Pads Cannot Work Loose
No Screws No Pins

HARDINGE Style "B" Master Feed Fingers and Pads





Pads interchange with Masters for different makes of machines having the same capacity.

Write for descriptive Bulletins.

HARDINGE Master Feed Fingers with Adjustable Tension - provide tension change to suit varying requirements.

To decrease tension, turn sleeve

To increase tension, turn sleeve

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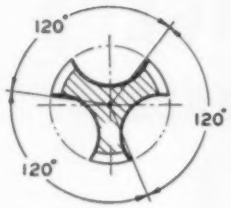
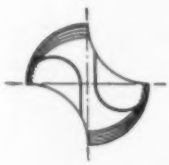


is the first fundamental of Balanced Action. It is accomplished by precision indexing.

UNIFORMITY OF FLUTE CONTOURS

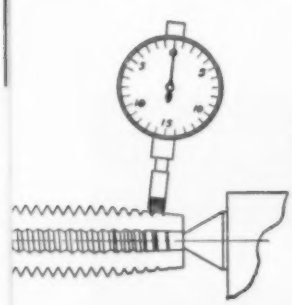
is essential, of course. You can't get Balanced Action without it.

PRECISION CHIP DRIVER CONTOURS



are exact to size, shape, and position —formed to give optimum performance.

ACCURATE AND CONCENTRIC CHAMFERS



By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy is assured.

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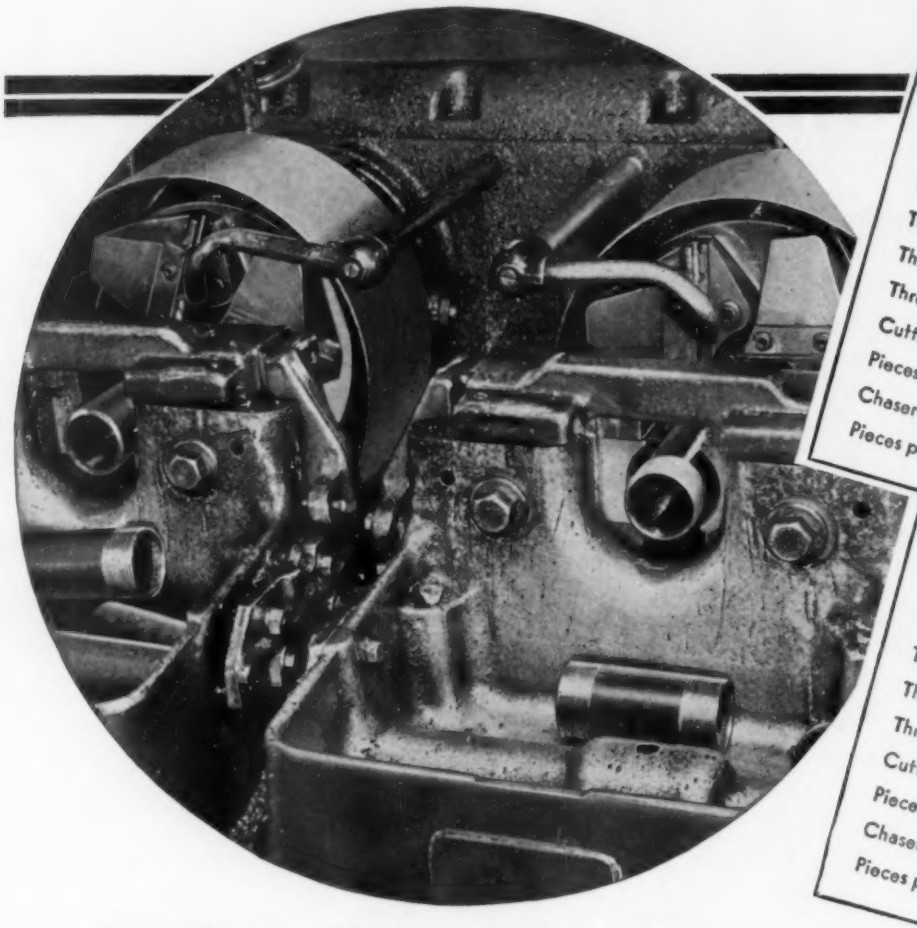

LANDIS MACHINE COMPANY
ENGINEERING DATA
Name of Part 3/4" x 2 1/2" Pipe Nipple
Material Galv Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 33 Ft. P.M.
Pieces per Hour 450
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3600

ENGINEERING DATA
Name of Part 3/4" x 10" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 38.3 Ft. P.M.
Pieces per Hour 400
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3400

ENGINEERING DATA
Name of Part 2" x 6" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1 1/16"
Cutting Speed 42.8 Ft. P.M.
Pieces per Hour 200
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 1800

ENGINEERING DATA
Name of Part 1 1/2" x 5" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1"
Cutting Speed 35.8 Ft. P.M.
Pieces per Hour 232
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 2000

PIPE NIPPLES...

450 pieces per hour
3600 pieces per chaser grind

Such production is proof of "high production and low cost"—yet thread tolerances are held to specifications. These figures are production results of a manufacturer producing steel pipe nipples, using LANDMACO machines equipped with air-operated carriage fronts. Different conditions might make an even higher output possible.

LANDMACO Pipe and Nipple Threading Machines thread, ream, and chamfer in one operation. Built in 1¼" and 2" single- and double-head models, these machines are equipped with either internal or external trip heads.

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and ROUTING
You can push your
PRODUCTION COSTS *'way down*

with this new, improved

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PROFILING MACHINE

FOR PRECISION OPERATIONS
on such parts as those listed here, you will find that the Wade No. 45 Profiling Machine "has everything!" It is remarkably easy to operate, compact, heavy, and rugged. It has plenty of power and 8 different speeds. Can be bench mounted, or will be furnished with a sturdy metal pedestal cabinet.

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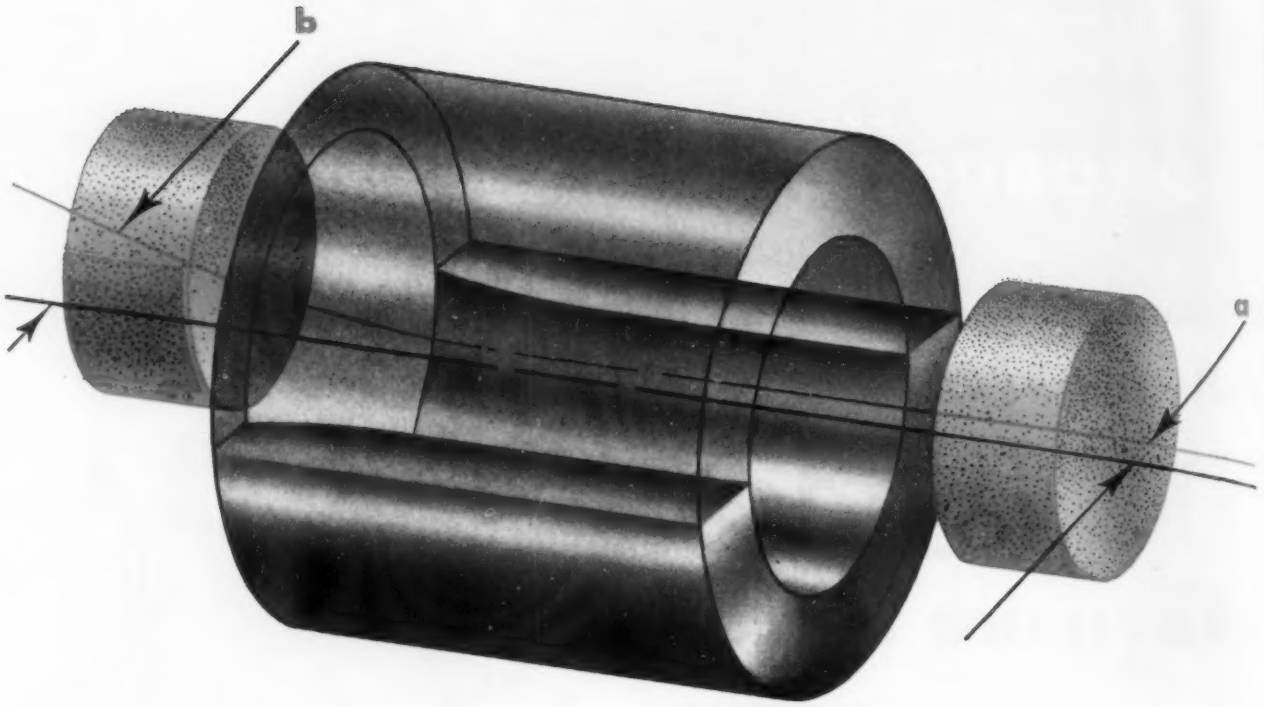
alignment

for better internal grinding

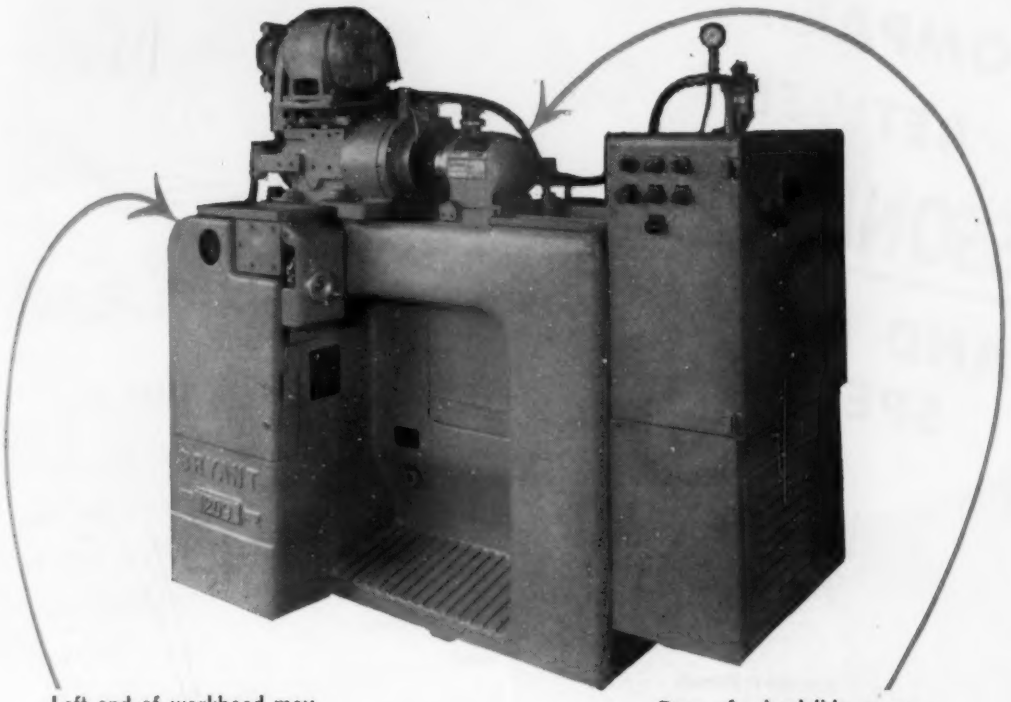


BELL mouth holes are a common internal grinding error. General available information advises simply turning the workhead or changing the length of traverse to correct this error, to generate a straight hole. In the case illustrated above, where bell mouth exists at one end of the hole, neither turning the workhead nor changing the length of stroke will correct this error.

In order to grind a straight hole the wheel must traverse the work in a straight line parallel to the axis of the work. The wheel path (the line in which the wheel traverses) is controlled by the slides under the wheelhead. If the slides are straight and true, the wheel path will be a straight line. If the path of the wheel varies from a straight line, the variation will be generated in the work.

At point "a" the wheel path and axis of the work are parallel and the wheel is set to grind a straight hole. Because of an error in the wheelslide

ways, the wheel path is distorted and the wheel is plunged into the back end of the work and the wheel path and work axis diverge as shown at point "b". Wheelslide error can introduce distortion of many types within the work in addition to the one illustrated. The remedy is to correct the wheelslide ways which will, in turn, straighten the wheel path. The wheel contact will be improved, resulting in better finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is designed particularly for high production, precision grinding of bores up to 3″ in ball bearing races, gears, rolls, bushings, etc. Operator merely loads work, trips a valve to start cycle and unloads the finished piece. The machine automatically rough grinds, finish grinds and returns to chucking position when finished size is reached. Wheelslide traverse is hydraulically operated, providing infinite traverse speeds and assuring smooth oscillation. Wheel speeds up to 100,000 R.P.M. are obtained with the Bryant Hi-Frequency Wheelhead. Write for folder.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

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Springfield, Vermont, U. S. A.

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WESSON TOOLS

LOOK AT THIS COMPARISON BETWEEN WESSONMETAL AND HIGH SPEED STEEL

with WESSONMETAL

Your Higher ORIGINAL COST RESULTS in LESS COST per PIECE!

Actual Job

Caterpillar Tractor Co.

Part Name..Cutting Edge Bulldozer Scraper Blade
Operation Description...Form Edge Scraper Blade
Machine Model—Type..Rockford Planer Series #4
Tool Type.....MX-7 Multicut Planer Holder
Planing Speed.....100 S.F.M.
Feed.....025
Depth of Cut.....0 to 7/8" Max.

OLD H. S. STEEL METHOD	NEW WESSONMETAL METHOD
Pieces per Grind.....½ to 1	Pieces per Grind.....13½
Total Tool Cost.....$49.25	Total Tool Cost.....$97.16
Average Pieces per tool life.....24 Pieces	Average Pieces per tool life.....324 Pieces
Tool Cost per Piece.....$.60	Tool Cost per Piece.....$.07

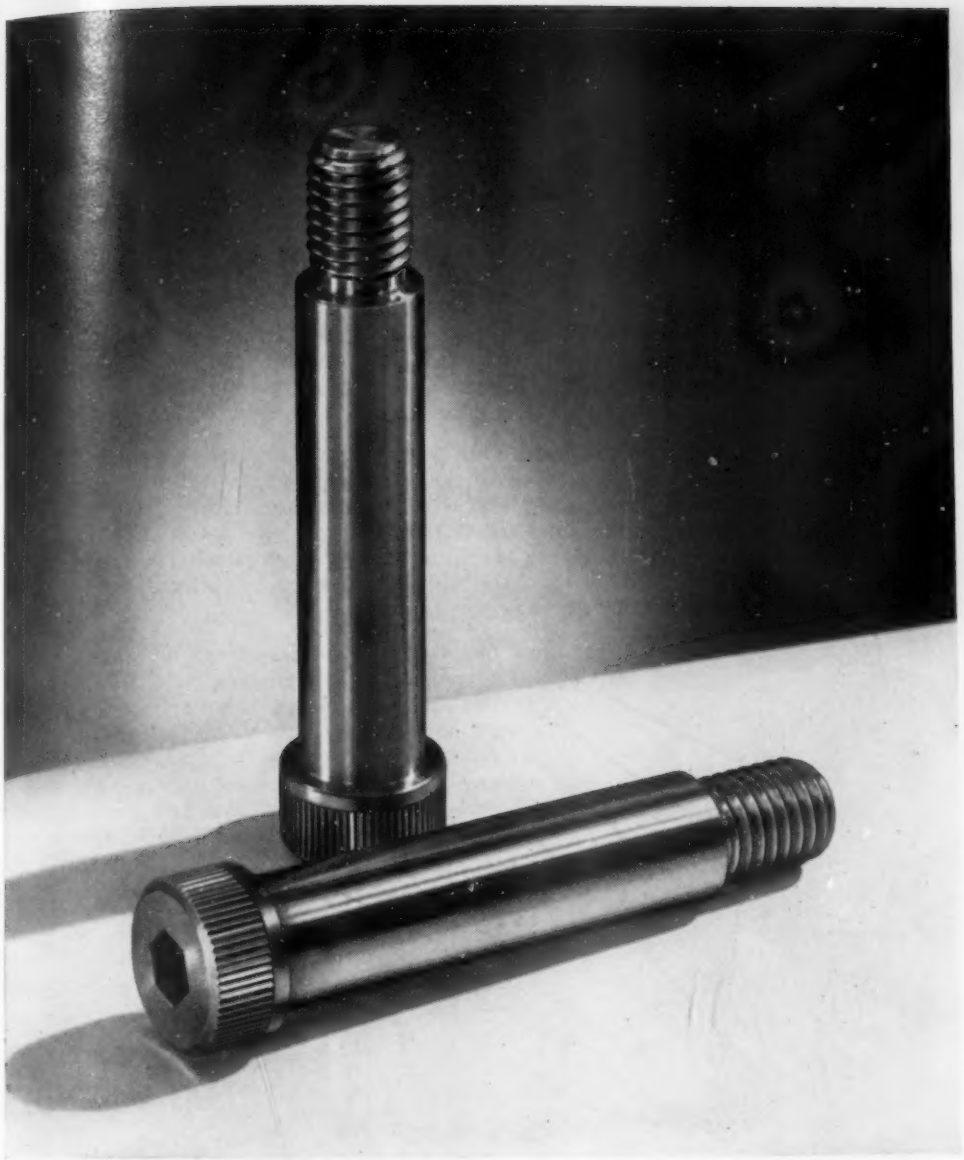
HOW IS YOUR PRODUCTION SCORE CARD?

Call the Wesson Tool Engineer in your area for complete service. Ask to see Wesson's new movie "This Carbide Age."

WESSONMETAL Cemented Carbide

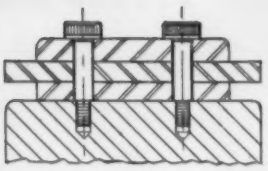
WESSON METAL CORPORATION
LEXINGTON 34, KENTUCKY

LAPOINTE SURFACE BROACHING

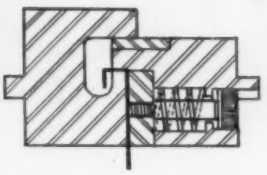


Our Fiftieth Year

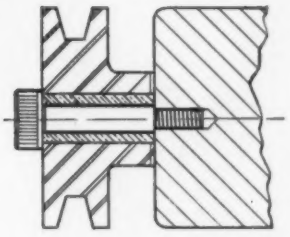
A START FOR THE FUTURE



Use UNBRAKO Shoulder Screws as stationary guides and as moving shafts or pivots.



For pressure pad and stripper plate applications.



As stationary shafts or pivots.

UNBRAKO SHOULDER SCREWS have these features: heat treated alloy steel for strength; knurled head for sure finger grip, fast assembly; accurate hex socket for positive internal wrenching; shoulders held to unusually close tolerances; threads and head concentric with body for uniformly accurate assembly; finished threads close to shoulder; fully formed threads, Class 3 fit; standard sizes, ¼" to ¾" in a full range of lengths.

Save time and money, use UNBRAKO standards

Modern methods and quality control produce standardized UNBRAKO socket screw products in large quantities at low cost. A nation-wide industrial distributor organization, which stocks UNBRAKO, assures you excellent service and prompt deliveries. Write for UNBRAKO Standards, a complete listing of standard products stocked by your local UNBRAKO distributor. SPS, Jenkintown 37, Pa.

Write for UNBRAKO Standards

UNBRAKO®

SOCKET SCREW DIVISION

SPS

JENKINTOWN PENNSYLVANIA

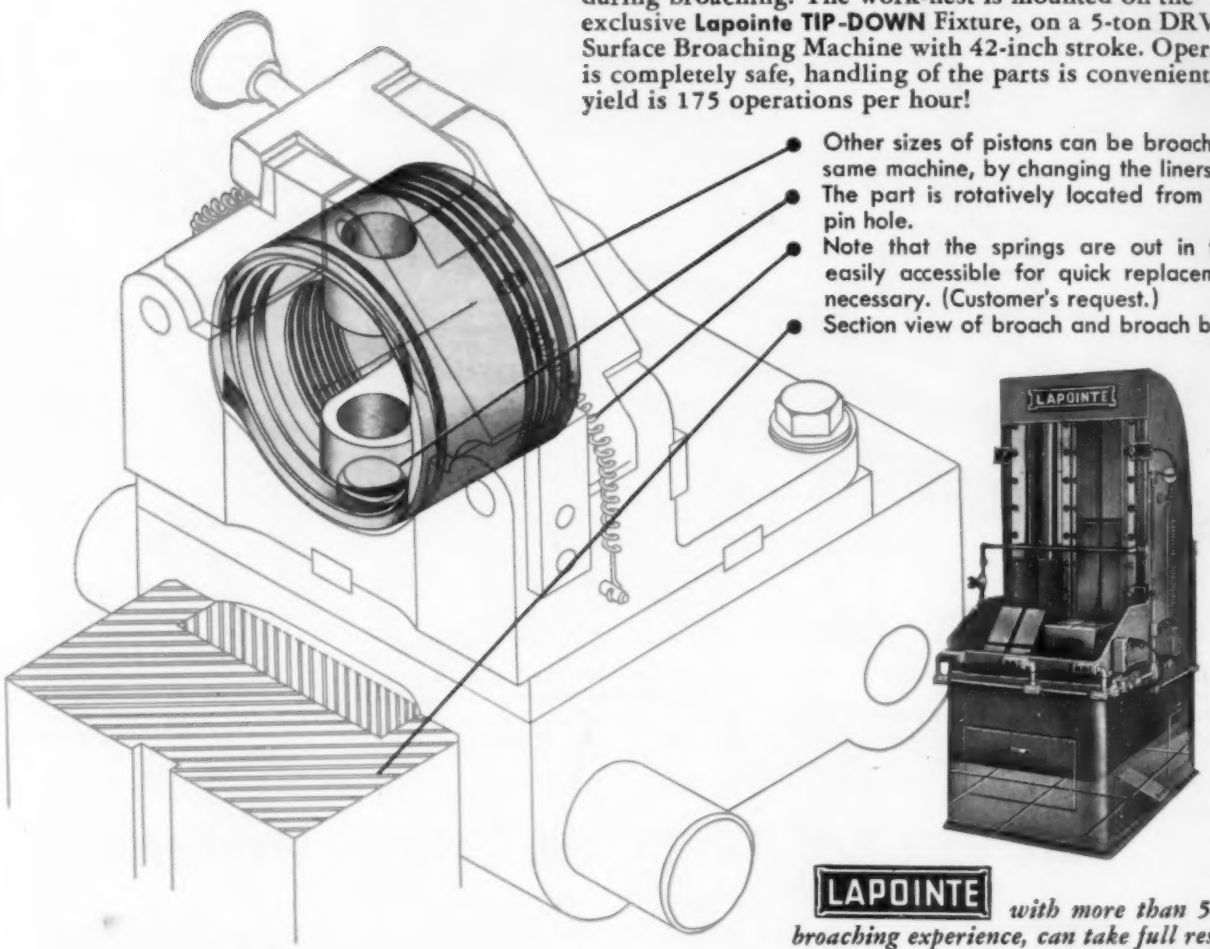
LAPOINTE SURFACE BROACHING

. . . the most economical method of metal removal

for high production!

This piston is a good example of what can be done by **LAPOINTE** surface broaching. A "contour cut" is broached crosswise, across the end . . . with the piston firmly held in a fixture of unique Lapointe design.

We call it a shroud. Our engineers developed this quick-acting fixture to encompass the part and prevent distortion during broaching. The work-nest is mounted on the exclusive **Lapointe TIP-DOWN** Fixture, on a 5-ton DRV Surface Broaching Machine with 42-inch stroke. Operation is completely safe, handling of the parts is convenient, yield is 175 operations per hour!


Other sizes of pistons can be broached on the same machine, by changing the liners.
The part is rotatively located from the wrist-pin hole.
Note that the springs are out in the open, easily accessible for quick replacement when necessary. (Customer's request.)
Section view of broach and broach body.
LAPOINTE

LAPOINTE *with more than 50 years of broaching experience, can take full responsibility for designing and building the machines, tools and fixtures to suit your requirements. For information,*

write for Bulletin **DRV-5**

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

A Complete LINE of STANDARD CARBIDE TOOLS and BLANKS
IMMEDIATE DELIVERY FROM STOCK

with WESSONMETAL
THE CARBIDE Specially ENGINEERED FOR METAL CUTTING!

Fine-Pitch Cone Type Face Mill inserted blade Solid or tipped blades

Boring Head

Heavy Duty Cone Type Face Mill for steel

"Rigidcut" Inserted Blade Face Mill Solid or tipped blades

Solid Carbide Standard Blanks

Solid Carbide Blades

Hi-Helix Cone Type Face Mill for Aluminum

STANDARD FLAT TOOLS
All sizes and styles

Solid Carbide Formed Blanks

"V-Nose" Blanks

Huskicut Tool Holder 70% more regrinds per tip

Reamer Blanks

Multicut Bond Type Tool Holders
101 Standard Sizes—changeable insert replaceable band.

Tipped Blades

WESSON-MULTICUT

THE WESSON MAN IN YOUR AREA
An Experienced Tool Engineer Trained in Carbide.

Tracer Lathe Tool Holder
55° insert up to 35° Clearance
Cuts to right or left

Standard Inserts

See "THIS CARBIDE AGE"
Wesson's Educational movie tells the story of carbide in sound and color.

Special Bond type Tool Holders

Wesson's new PLANER TOOL Replaceable Blade.

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WESSONMETAL CORPORATION
LEXINGTON 34, KENTUCKY

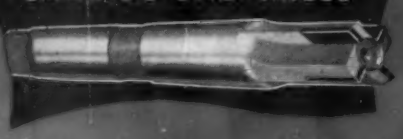
Production Pointers

GISHOLT

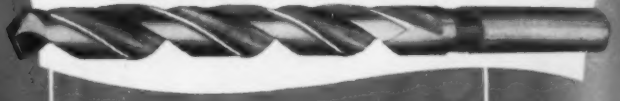
STANDARD CARBIDE TOOLS

by SUPER

CARBIDE END MILLS



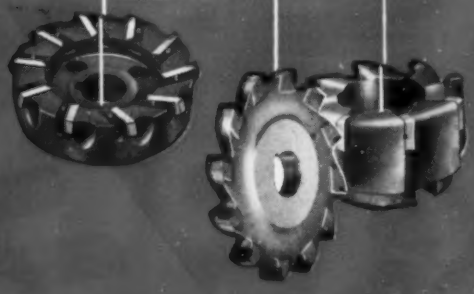
CARBIDE TWIST DRILLS



CARBIDE REAMERS

CARBIDE SPECIAL TOOLS

CARBIDE MILLING CUTTERS



CARBIDE TOOL BITS

The Super line of carbide tools features aggressive and up-to-the-minute thinking in cutting tool design. More than 50 items in a complete range of sizes are carried in stock in warehouses conveniently located in New York, Detroit, Chicago and Los Angeles.

Super TOOL COMPANY

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also 5210 San Fernando Rd., Glendale 3, California

GISHOLT

ELLIPTICAL MACHINING MADE EASY

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

GETTING MORE WORK PER CHUCKING WITH C/F TURRET LATHE

Only One Tool Change Required for Variety of Sizes with Expert Setup

This producer's problem was one of sizes. How to get fast operation on chuck bodies in a variety of sizes with minimum possible tooling and changeover.

The solution is smart . . . and noteworthy. A Gisholt 1L Cross Feeding Saddle Type Turret Lathe was selected for the job. This was equipped with a 15″ 3-jaw air chuck. This not only kept chucking time low, but also, by the use of adjustable serrated jaw bases, just one set of jaws sufficed for operation 1 to handle the numerous sizes of workpieces.

The quick indexing square turret on the cross slide has tools for turning, facing, chamfering, etc. These work simultaneously with tools from the hexagon turret, a time saver on any job.

Cross Feeding Turret Speeds Job

The hexagon turret is equipped with three stub boring bars for boring, counterboring, recessing or back facing. Size is set with the cross feeding turret; therefore, these same boring bars are used on many sizes of parts.

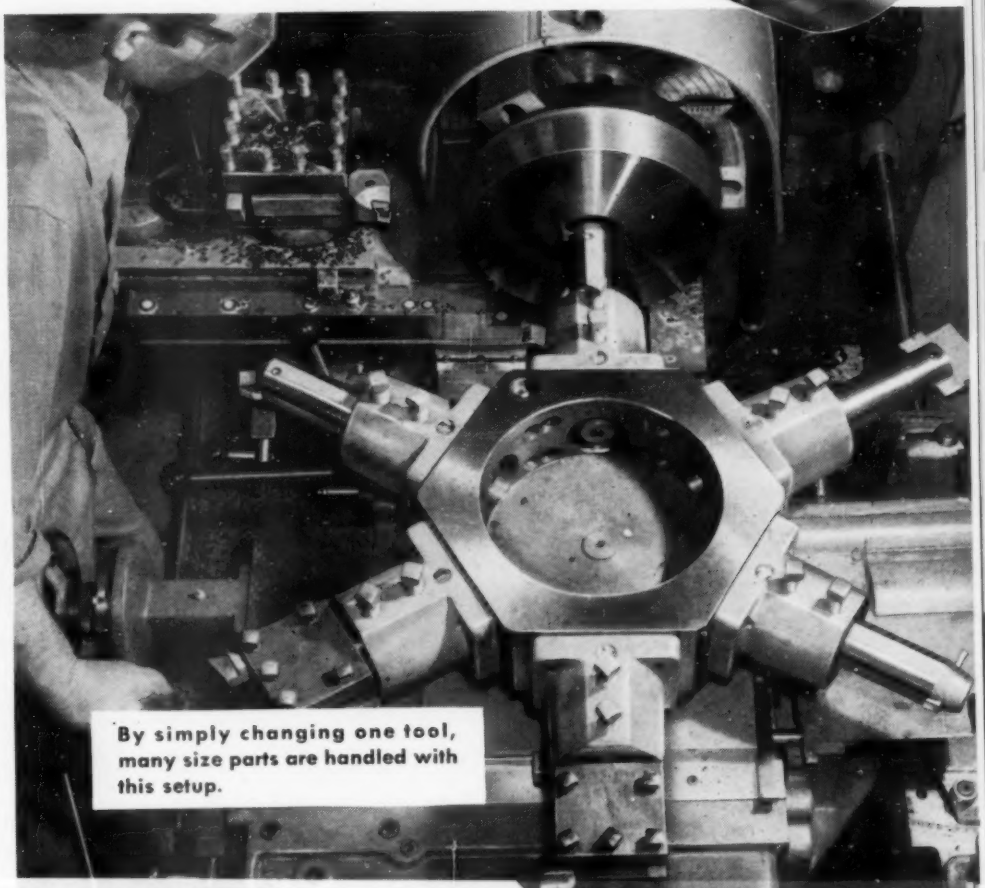
Also carried on the hexagon turret are two box-type tool posts. These are used for facing, boring or recessing. Again, because of the cross feeding hexagon turret, they are used for workpieces of various sizes.

The sixth tool on the hexagon turret is a spade cutter for final sizing. This is the only tool special for each job. A quick change of this single tool readies the machine for the next job. The high production Saddle Type Turret Lathe has two additional attachments for even greater versatility. A threading attachment permits threading the hub when required. A taper attachment offers tapers up to 8 inches per foot for a wide variety of diameters.

This job shows again how you generally can do more work with fewer tools. When you specify a cross feeding turret lathe, Gisholt's 66-year experience can help you.

Simple tooling, combined with the time-saving cross feeding hexagon turret, give maximum efficiency in handling parts of various sizes.

Typical completed workpiece.



By simply changing one tool, many size parts are handled with this setup.

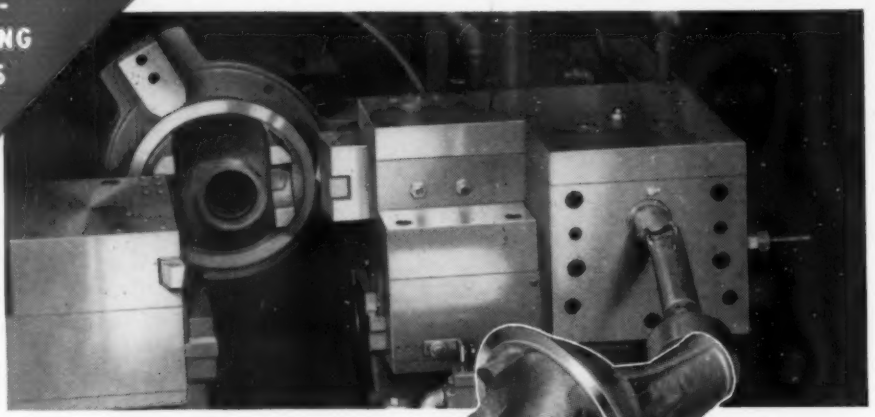
MAKE MORE MONEY FOR YOU!

GISHOLT

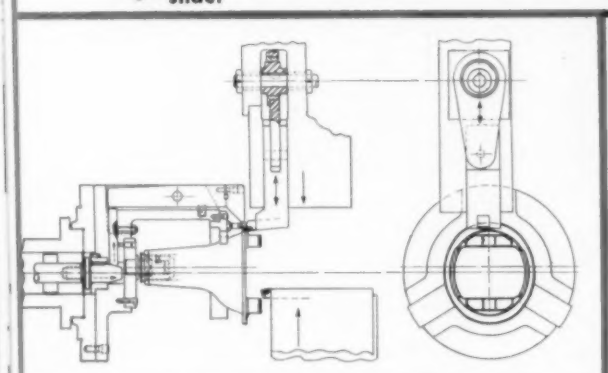
TIME-SAVING IDEAS

ELLIPTICAL MACHINING MADE EASY

Standard Simplimatics Solve Special Problem



Tooling layout. Note action of rear tool slide.



Circle indicates elliptical shape of workpiece.

An elliptical diameter was the stickler here. How to machine the oval shape . . . and do it on a standard machine and do it automatically?

The answer, this manufacturer found, was with the 3D Simplimatic Automatic Lathe. To do the elliptical pilot diameter on this differential carrier, a standard machine is used. Only a special cam-operated auxiliary tool slide mounted on the standard rear slide, is required. This does both facing and turning and moves in and out two times each spindle revolution, generating the elliptical shape. When conventional facing and turning are called for, this slide is simply locked in position.

The standard front slide can be used for either facing or turning the bearing pads, merely by re-positioning at a 90° angle. Time for this part is 1.75 min. and one operator easily handles two identical machines for all production needed. Four different carriers are handled with simple changeover.

The simple addition of a special reciprocating tool slide equips standard Simplimatics for fast, automatic production of elliptical parts.

For complete picture reports on this and 30 other interesting jobs, write for new Simplimatic catalog.

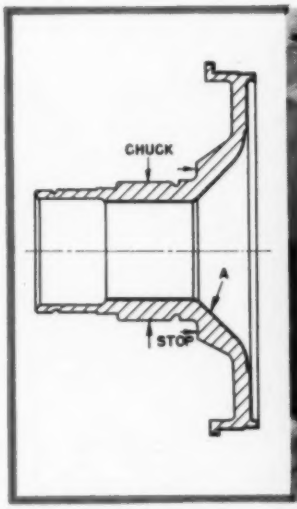
NOVEL SETUP FOR STEEP BORING

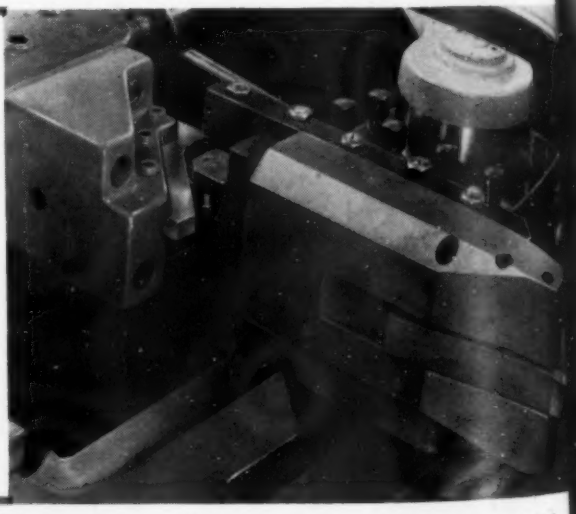
This Idea Pays Off on Ram Type Turret Lathe Job

The next time you are faced with generating a steep bore similar to this, remember this production pointer.

The problem surface (see A in drawing) combines a face, radius and a 45° angular bore. Using a standard Gisholt No. 4 Ram Type Turret Lathe, a special cam is mounted on one face of the hexagon turret. On the square turret is a special spring-loaded roller slide. Here's how it's done:

Both the hexagon turret and square turret carriage are brought into position and locked. The cross slide carrying the square turret is then fed forward. As the roller on the slide tool engages the cam, the tool bit generates the interior surfaces shown. From start to finish, the job is simple. All other tooling is standard. Thus, you can handle this job—or a variety of others—quickly, economically, with very reasonable tooling costs.





The complicated interior of these rotors are generated with repetitive accuracy by the cam-guided slide tool in the square turret.

Note how sliding tool on square turret is guided by cam on hexagon turret.

facilities for even greater versatil-

MAKE MORE MONEY FOR YOU!

GISHOLT

TIME-SAVING IDEAS

SHELL PRODUCTION...ON THE DOUBLE

No. 12 Hydraulic Lathes Enlisted for Speedy Operation

Speed was the No. 1 requirement here ...in centering and cut-off operations on 75mm. and 105mm. shells.

Here's how two different plants are pushing production using identical setups on No. 12 Hydraulic Automatic Lathes: The forgings are located from the bottom of the cavity on a mandrel and held by two sets of air-operated expanding fingers.

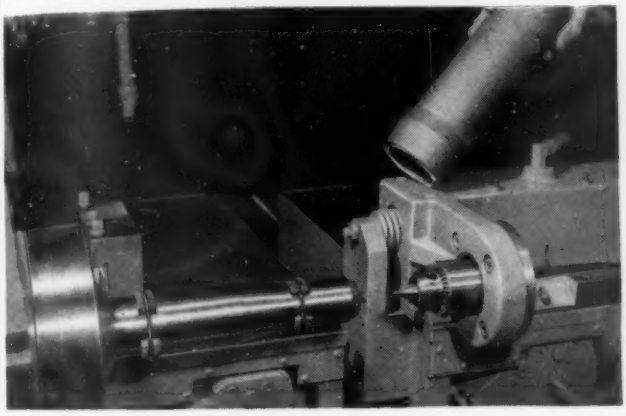
The left rear slide carries a tool block with a single tool for cut-off to length. The right slide carries an auxiliary slide on which is mounted a speeder with a center drill. The main slide moves back at the end of the cycle to clear the work for unloading.

Floor-to-floor time on the 75mm. shell (photo A) is about 0.6 minutes. Time for the 105mm. shell (photo B) is approximately 0.8 minutes. In both cases, the operators have ample time to handle two or more machines because of the automatic cycle.

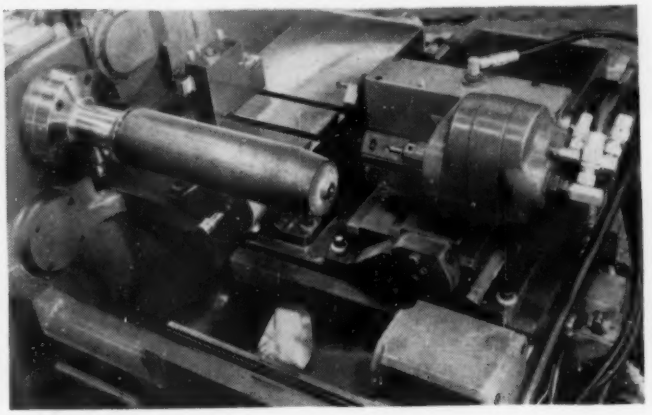
In this first machining operation, shells are faced to length . . . open end is squared . . . and proper center is established—all handled automatically, quickly and economically.

A complete catalog on the No. 12 Hydraulic Lathe is available.

(A) Close-up of No. 12 Hydraulic Automatic Lathe for work on 75mm. shell shown.



(B) Time for this 105mm. shell is 0.8 minutes.



4-MACHINE SETUP MAKES FAST WORK OF THIN-WALL PARTS

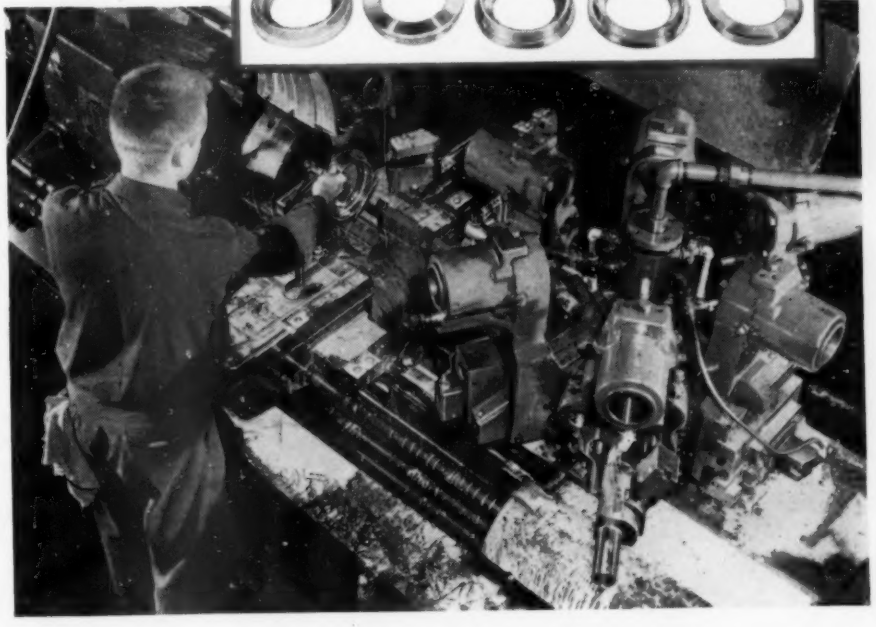
Costs are Low with one man and four Fastermatic Automatic Turret Lathes

This problem was one of accurately producing parts which require considerable stock removal, leaving them thin and frail. This precludes taking off too much metal at one time. Also, heavy chucking pressure has to be avoided to prevent distortion.

The only practical way to do it is by spreading the work over a series of relatively light cuts and doing the job automatically to keep costs low. The Fastermatic Automatic Turret Lathe, therefore, was the logical solution—with four machines handling all operations. All machines can be handled by one man since total labor time is six minutes per piece. The .004" tolerance demanded by the thin-wall section is easily met because of the Fastermatic's automatic cycle and the elimination of human error.

These thin-wall parts are accurately and economically produced by a sequence of light cuts with four Fastermatics and one man.

Rough part and after each of four operations.



Setup on one of four Fastermatics doing this job.

GISHOLT

TIME-SAVING IDEAS

HOW BALANCING PROTECTS THIS VITAL AIRCRAFT ASSEMBLY

Required Correction Shown by Direct Readings

Vibration means trouble for aircraft cabin superchargers. To insure smooth, dependable operation at high rotating speeds is this Type 13S Gisholt DYNETRIC Balancing Machine.

This 6-lb. assembly is supported in a cradle, rotated at 2300 r.p.m. and the amount and location of unbalance in each plane recorded. Stock is then ground off until a recheck indicates that the tolerance of .424 gram-inches has been met.

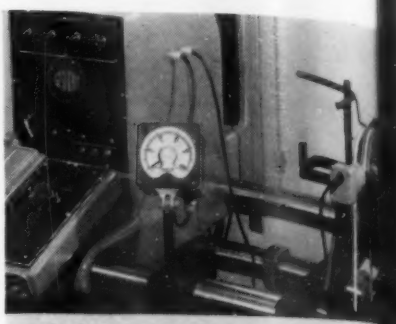
Each scale unit on the machine's direct-reading amount meter represents .1 gram-inch of unbalance. Therefore, the operator need balance to only 4.24 scale units on the meter to be within the prescribed tolerance for each correction plane. The extreme sensitivity of the machine with dial readings which provide an amplification of unbalance effect, permits greater ease and handling speed.

Whether unbalance is read in terms of stock to be removed or length of material to be added, ease of calibration is just one important feature of Gisholt Balancers.

Unbalance in terms of gram-inches is quickly measured by this Balancer with correction made by grinding off metal.

DYNETRIC BALANCERS GISHOLT

DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

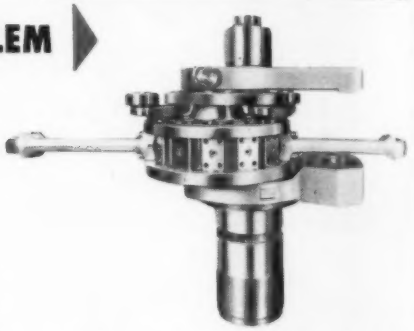


Simple to operate, this Balancer gives fast, accurate unbalance readings in gram-inches.

Production Balancing

. . . is one of the many helpful subjects fully covered in the Gisholt Balancing School—only service of its kind available to industry. Write for details and starting dates . . . four classes scheduled for January and February.

SIMPLE SOLUTION TO SPECIAL CRANKSHAFT PROBLEM



Superfinishing large bearing surface by means of attachment to boring mill.

No. 11-1253
614

Nordberg Shows How Big Job is Handled At Small Investment with Superfinishing

Like many others, Nordberg Manufacturing Company solved an otherwise difficult problem through the simple expedient of Superfinishing. Extra-long bearing life is assured because Superfinish takes these critical surfaces down to base metal, removing the soft, annealed "smear metal" left by grinding heat.

The crankshafts in Nordberg Radial Engines have a *single* throw and require only two main bearings. With the force of 2125 h.p. acting on these bearings, as in the case of a 12-cyl. model, you can see the need for an accurately controlled bearing surface.

This is done at extremely low cost, both in equipment investment and in time—because of the adaptability of this modern process. Using existing equipment, a No. 3 Superfinishing Attachment is mounted in a standard tool head of a vertical boring mill. The workpiece is clamped to the rotary table in the usual manner, completing the simple setup.

Superfinishing is satisfactorily accomplished with on-hand equipment . . . without the expense of a special machine for this operation.

See how the basic advantages of Superfinishing—better, longer-wearing surfaces that cost less—can be applied to your problems. The textbook, "Wear and Surface Finish," reports fully on Superfinishing; ask for it.

With a low-cost attachment for existing equipment, these very large bearings get better, longer-lasting surfaces through Superfinishing.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT

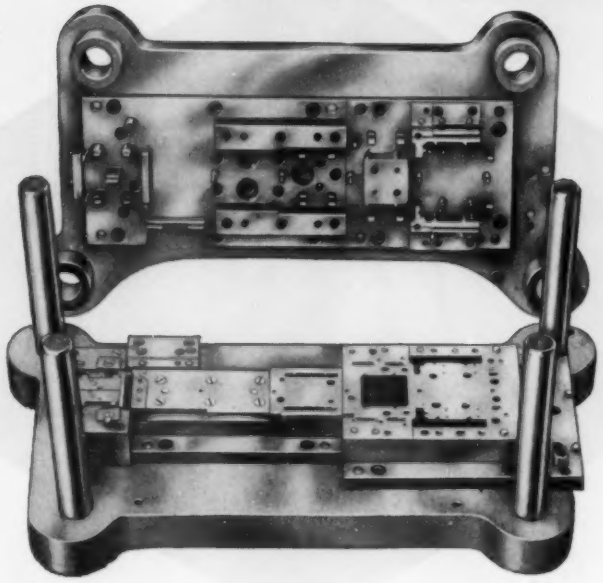
Write for your copy of Gisholt's new general catalog.

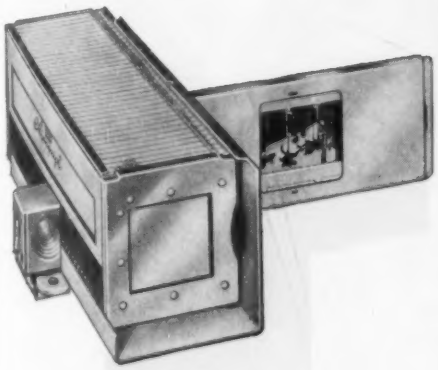
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

200 frames a minute. on PRODUCTO DIE SET





PERFORMANCE

12,000 pieces produced per hour
Over 2 million pieces produced between grinds
Continuous operation for 20 months

EQUIPMENT

Die: six-station (piercing, forming, cut-off)
Die Set: Producto special four-pin
Feed: special high-speed automatic

SPECIFICATIONS

Frame Size: 2.157 inches by 2.020 inches
Tolerances: plus .000 inch minus .005 inch
Material: .010 inch thick 52 S-H38 aluminum

Need Prompt Service? Call Your Nearest Producto Branch:

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Cleveland 14 — 3200 Lakeside Avenue
Dayton 7 — 3632 Delphos Avenue
Chicago 44 — Federal Machinery Sales Co.
Los Angeles 21 — Jamison Steel Corp.
San Francisco 7 — Jamison Steel Corp.

It is no secret that the ease of operation of the slide changer, illustrated above, is due to the precise stamping of the frames. To obtain consistently accurate frames, the Airequipt Mfg. Co., New Rochelle, N. Y., selected a Producto die set to mount their die. Result — practically no rejects, and an amazing production rate of 200 frames per minute!

Call your nearest Producto branch . . . they have the answer to greater stamping accuracy and higher production.

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FOR PRECISION DIE SETS . . . FAST . . . CALL . . . PRODUCTO

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4PD82

Cut your TOOL GRINDING costs...

CARBO

REGISTERED

with wheels engineered for the job

Choose the *right* grinding wheel for *every* tool grinding job—from the complete line by CARBORUNDUM.® That's the first step toward longer cutting life for your tools... lower maintenance costs in the tool room.

Every tool room grinding wheel by CARBORUNDUM is engineered to do a specific job at the lowest possible cost. You may want faster production of cutting angles, rakes and clearances; or perhaps better finish is more important; or cooler cutting. Whatever features, or combinations of features, you may require—there's a tool room grinding wheel by CARBORUNDUM that's *right* for you ...a wheel with the right grain type and size, the right grade and structure, the right bond. Whether you're grinding high speed steel, alloy, or cemented carbide cutting tools, not only these wheels but coated abrasive belts by CARBORUNDUM will help you cut costs.

Your CARBORUNDUM Distributor or salesman is ready to help you make the right selection of wheels for every grinding operation in your tool room. His wide experience in evaluating all the variables—and coming up with the right answers—makes him the most valuable consultant your tool room can have. Why not call him today? He's listed in the yellow pages under "Abrasives" or "Grinding Wheels."

FREE two helpful booklets...

tell you many ways to cut costs and improve grinding techniques in your tool room.

THE CARBORUNDUM COMPANY, Dept. TE 81-316
Niagara Falls, New York

Please send me ☐ "Maintenance of Alloy and High Speed Cutting Tools"

☐ "Grinding Cemented Carbides"

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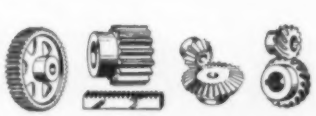
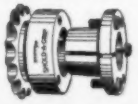


SPROCKETS and CHAIN

SHOLD-A-GRIP Interchangeable Tapered BUSHINGS and SPROCKETS



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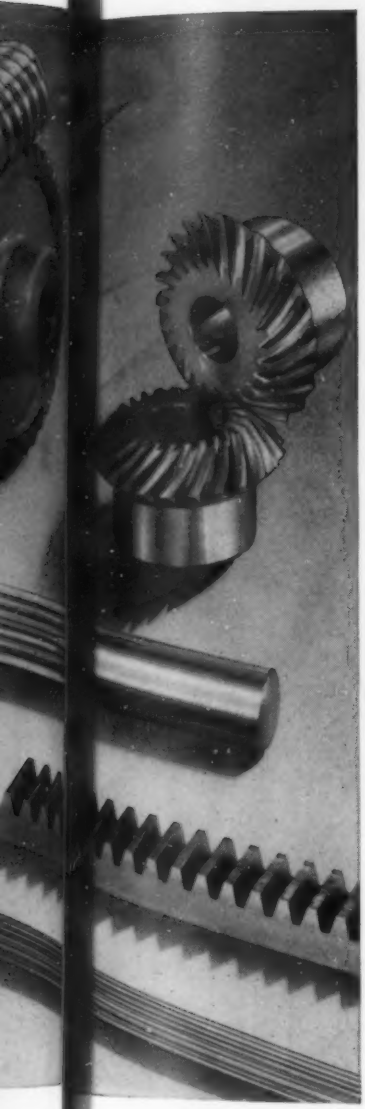

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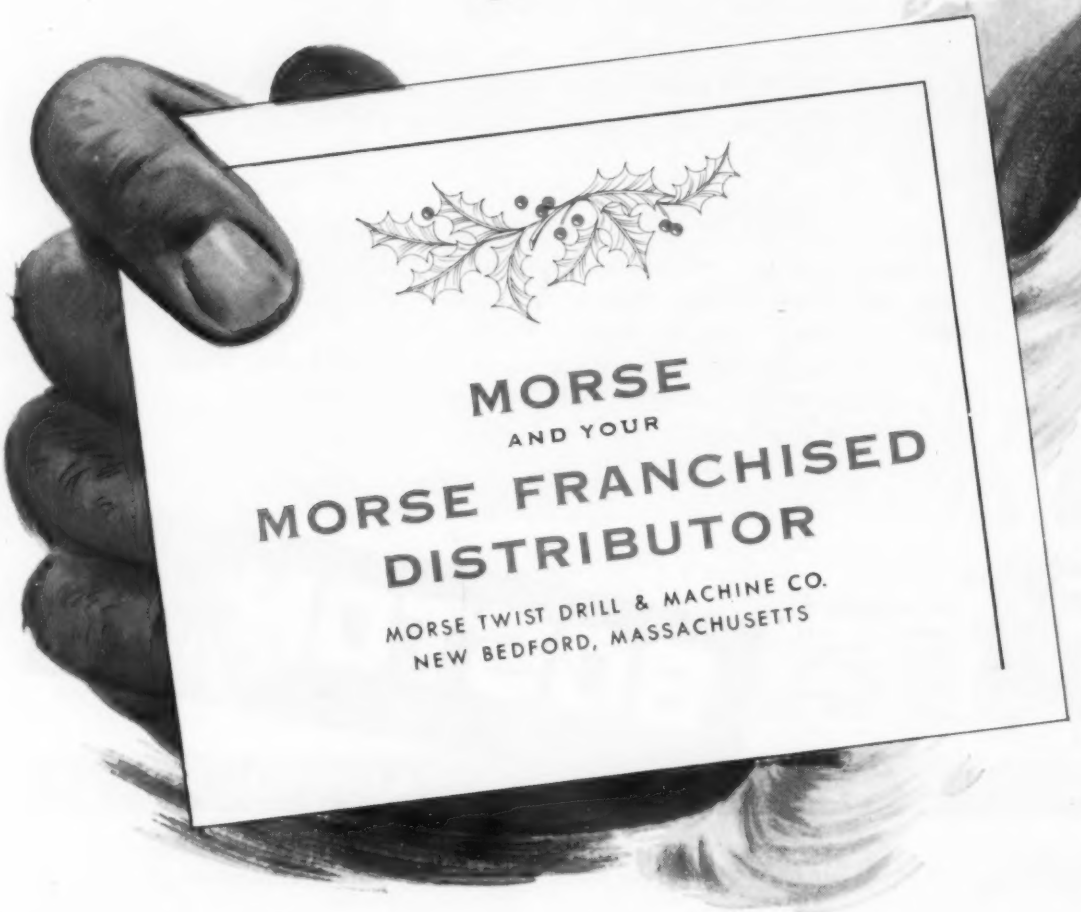

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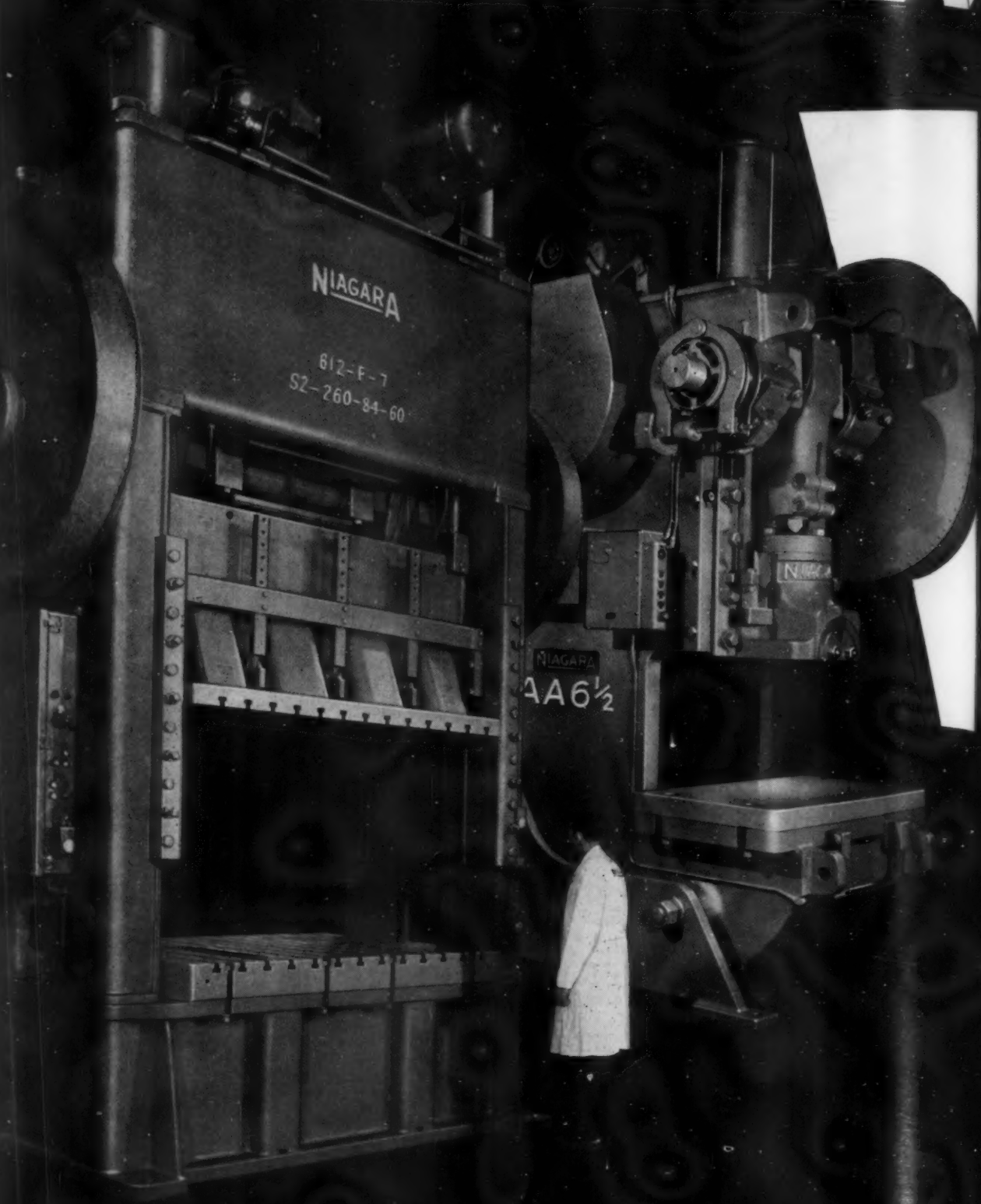

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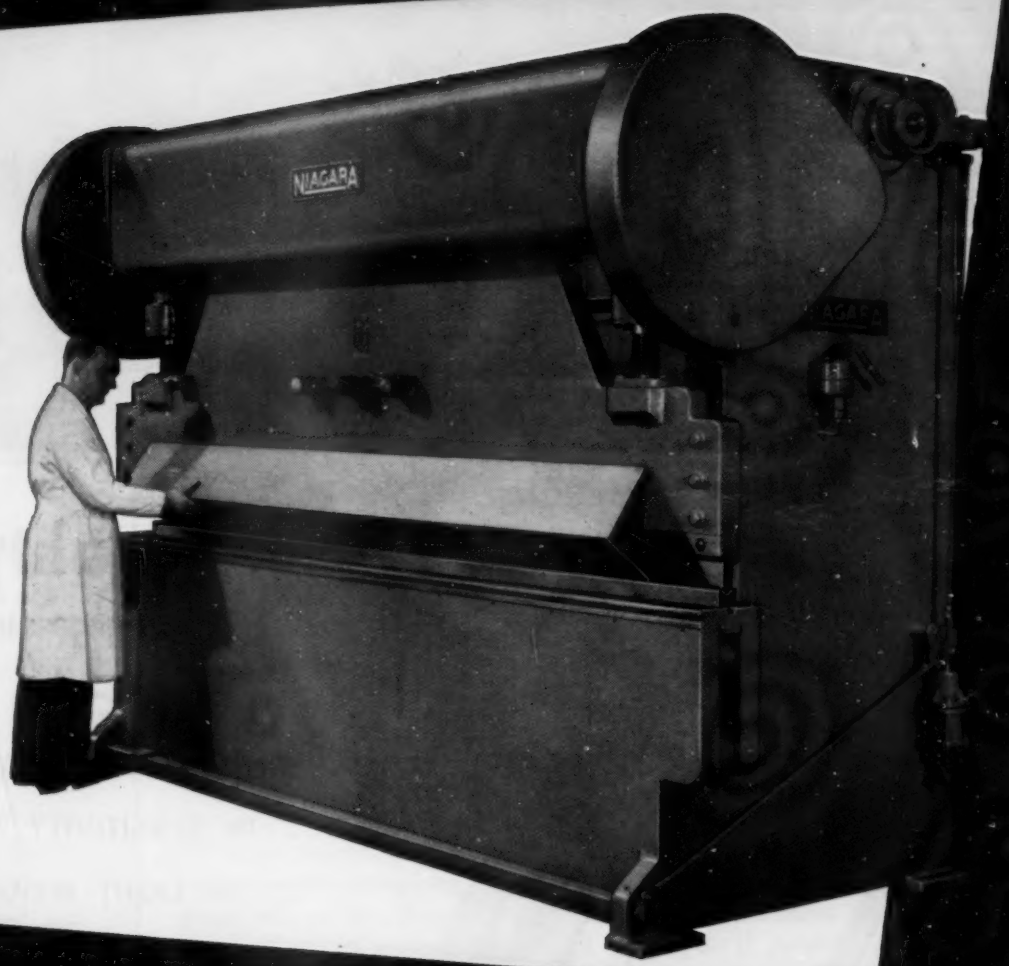

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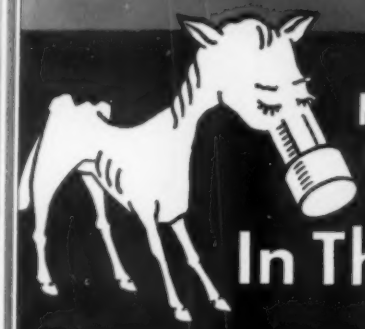

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Users everywhere say:

DuBo* is the MODERN DuBo Plug Gage

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Gaging Surfaces are Portions of a Sphere

Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!

COLOR Gives INSTANTANEOUS "FOOL-PROOF" INDICATION of GO and NO GO

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NO plug gage can equal DuBo

. . . IN ACCURACY

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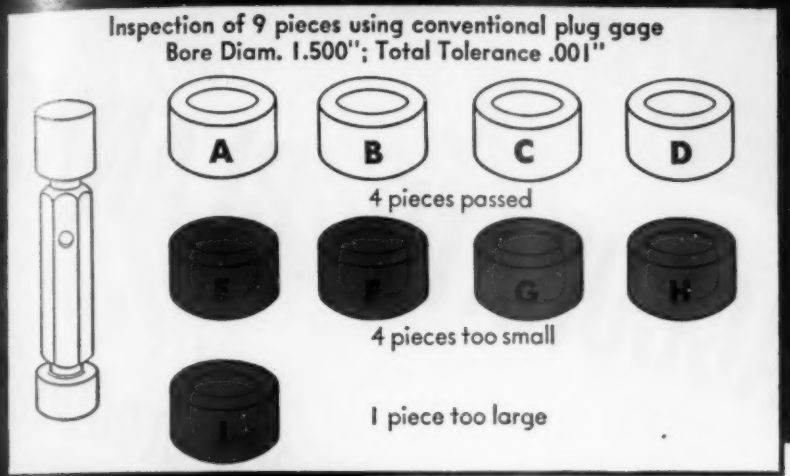
Like so many items of modern design, DuBo Plug Gage *looks* different and *feels* different from the conventional plug gage. And even craftsmen of the old school, used to time-worn methods, quickly get the feel and take pride in the use of this *different* tool. *Added to that are the many actual cases where DuBo, after a fair trial, has replaced conventional plug gages.*

With exceptional ease of handling, DuBo gives a precise, definite and sensitive check of bore diameters, directly and with no element of confusion, even in unskilled hands. In the same application, DuBo reveals dimensional variations such as taper and out-of-round which ordinary plug gages cannot indicate.

An ABC Demonstration of DuBo* Plug Gage Superiority



RESULTS of same inspection using DuBo Plug Gage

Of the 4 pieces passed by conventional plug gage above, only 3 are actually within specified limits when inspected with the more sensitive DuBo plug gage.

DuBo reveals piece D (passed above) is too large.

Of the 4 rejected as too small by conventional plug gage, E and F are actually within the limit when inspected with DuBo plug gage.

I, rejected by conventional gage as too large, is so verified when inspected with DuBo plug gage.

Of nine pieces inspected, DuBo reclaimed two false rejects and rejected one piece that had been passed by ordinary plug gage inspection. Apply even a fraction of this ratio to a day's production in your own plant and you'll realize the advantage of using DuBo Plug Gages.

COST-SAVING FACTORS

DuBo Plug Gages outlast ordinary plugs many times. Extremely light in weight (in the larger sizes, 70% to 80% lighter than cylindrical plug gages of equivalent diameter) and requiring no jockeying into position for entry, DuBo effects economies in that important cost item, actual inspection time.

Use DuBo for Precision Plug Economy

When inspecting parts under quality control sampling procedure, it is important that those parts which may be close to either end of the tolerance range be properly classified. The definiteness and simplicity of DuBo gaging is a decided advantage in this type of inspection. Anyone who has tried to enter a cylindrical plug into a hole only .0001" larger than the gage, knows how difficult it is. For even skillful workers there is a point at which it becomes doubtful whether the bore is actually smaller than the gage size, or if it is larger and merely close. With DuBo Plug Gage, even an unskilled worker can easily enter the gage under any condition and quickly interpret bore conditions correctly. There need be no border-line cases of doubt regarding the proper classification of a bore. Use of the DuBo Plug Gage minimizes the cost of parts needlessly rejected and the expense accruing from those incorrectly passed.

TRY DuBo! Sense its craftsmanlike feel and balance. See how easily it enters, even in undersize bores . . . how gentle manipulation of the handle accurately reveals internal conditions. Use it on a *fussy* job and you'll KNOW why DuBo is replacing old time plug gages everywhere! Refer to Catalog C, Pages 18, 19, 20, 21. Or, write or phone for more detailed information.

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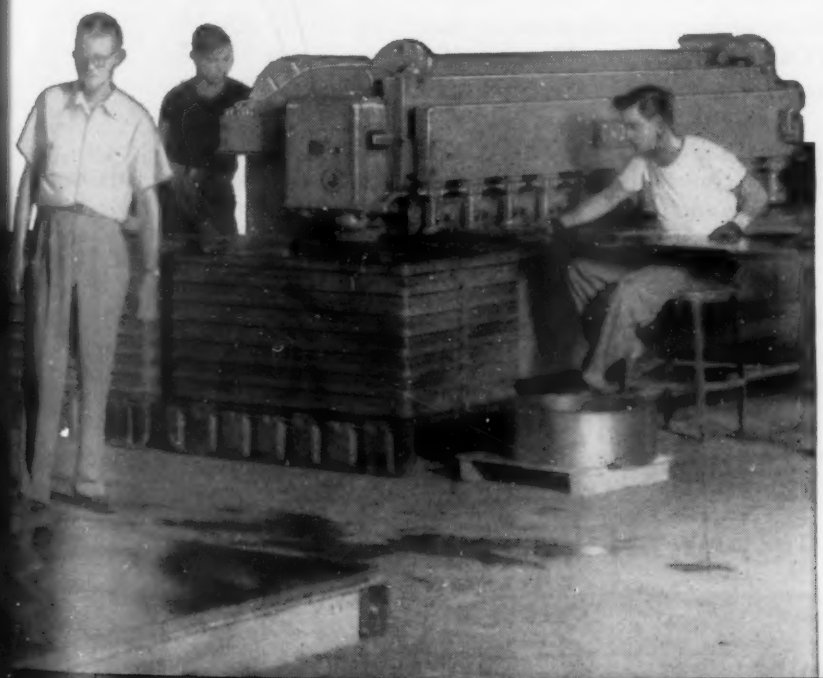

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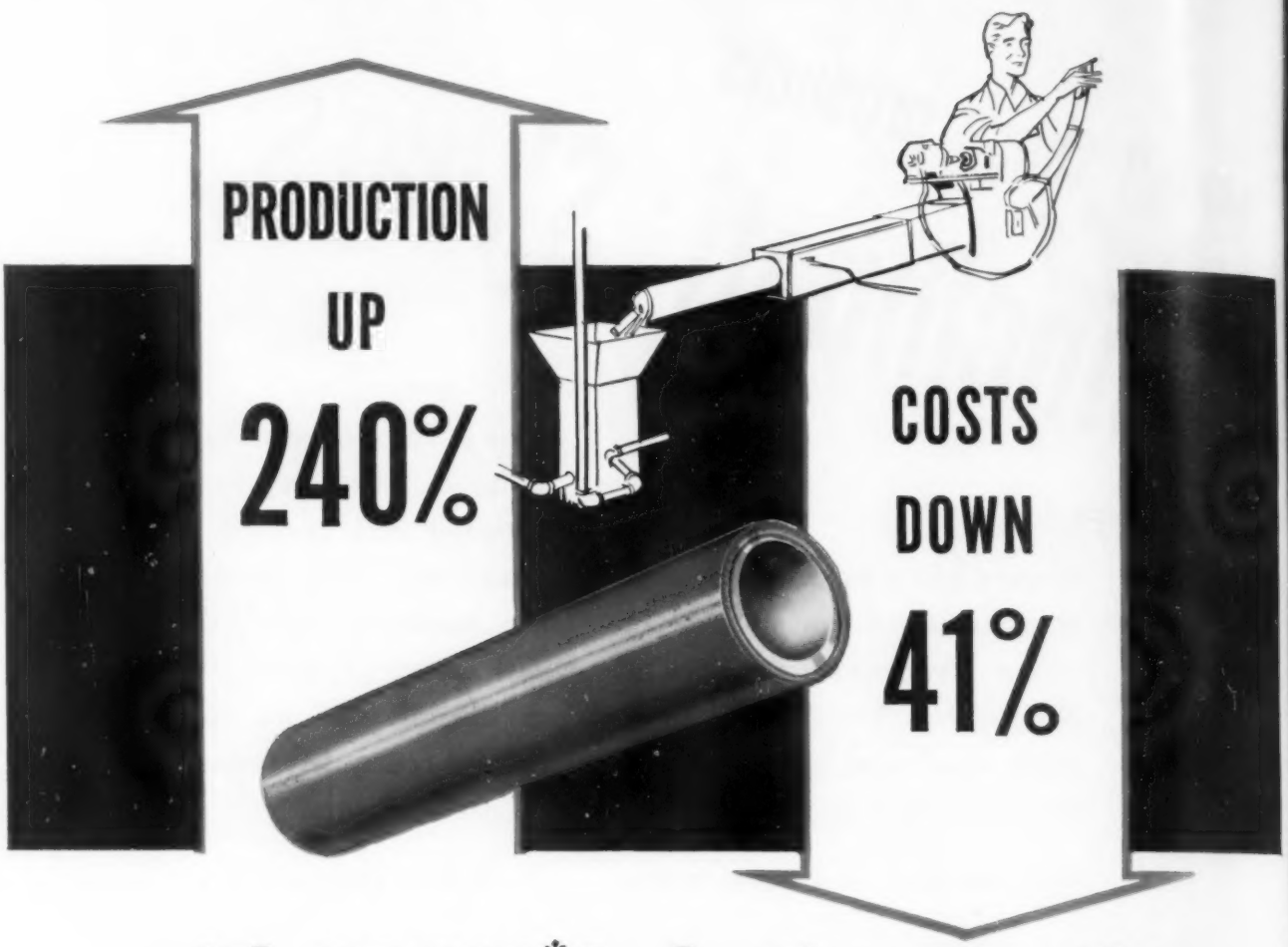

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The Tool Engineer

Dangerous Prosperity

Human nature being what it is, it is very easy to become complacently satisfied with the status quo, particularly if the economical wolf has been kept from the door.

A society, just like a business, must vigilantly re-examine itself periodically to assure that those in its management understand fully its real aims and purposes. We must assure that in the changing tempo of world affairs our Society is vigorously pursuing a course providing the most good for its membership and humanity.

The American Society of Tool Engineers is unique in its insistence that its management be a cross section of its membership constantly attuned to and working for the greatest good of our members, industry and the nation whom we serve.

To avoid the dangers of complacency, the Society has completed the most thorough Society introspection in ten years, the results of which were reported to your Board of Directors at its Dayton meeting a month ago. In brief, the Board

1. Reaffirmed the original aims and purposes of our founding fathers.
2. Confirmed by thorough restudy that the most descriptive designation for our activities is still to be found in the name, "Tool Engineers."
3. Approved a vigorous new program to impress government, industry and educators with the real value of technical society "extension education" in the American way of life.
4. Approved the last House of Delegates' request to increase the membership of the Board of Directors.

We are indeed thankful for a sound financial structure—but more thankful that our membership is permanently united to keep industrial America strong and healthy.

R. F. Waindle

PRESIDENT
1953-1954

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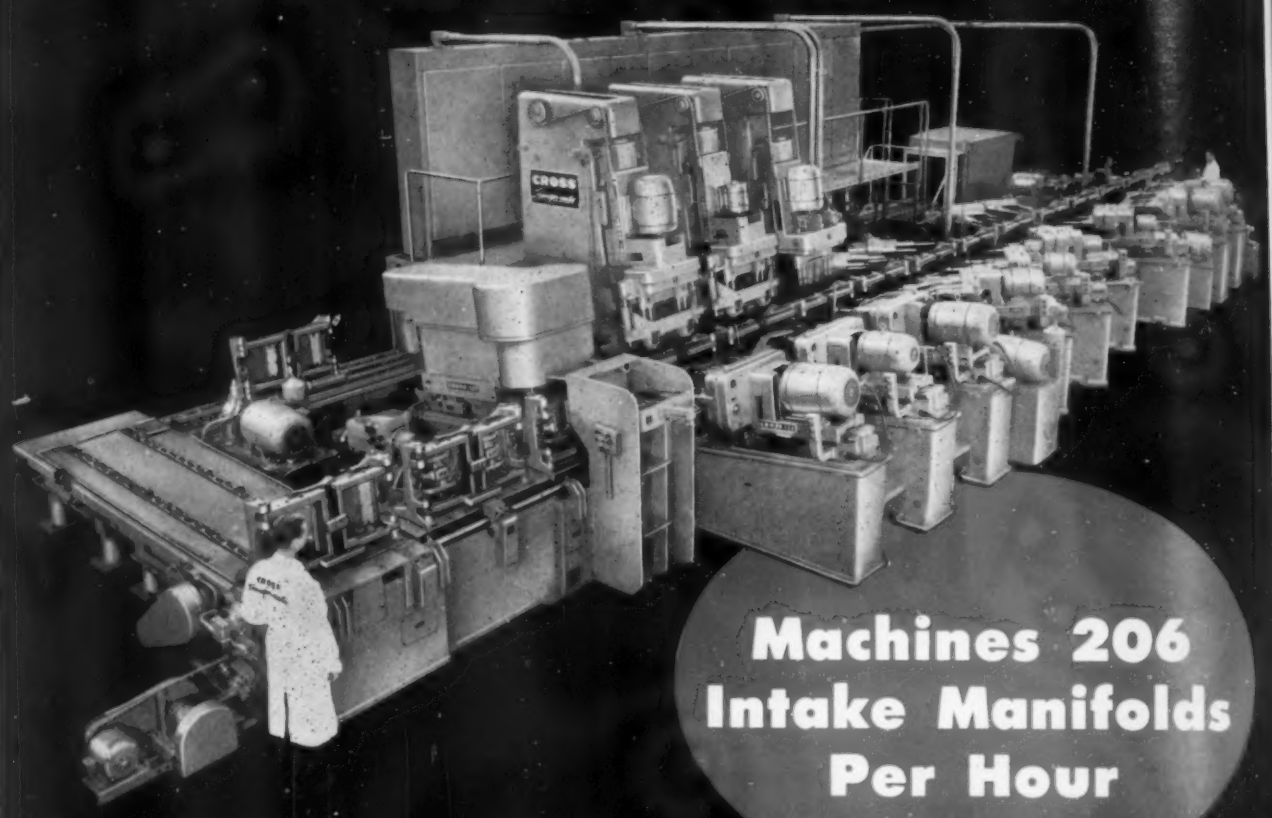

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time. Where ordinary brazed tools on high produc-

loads on cutting tools in operation. One rule is

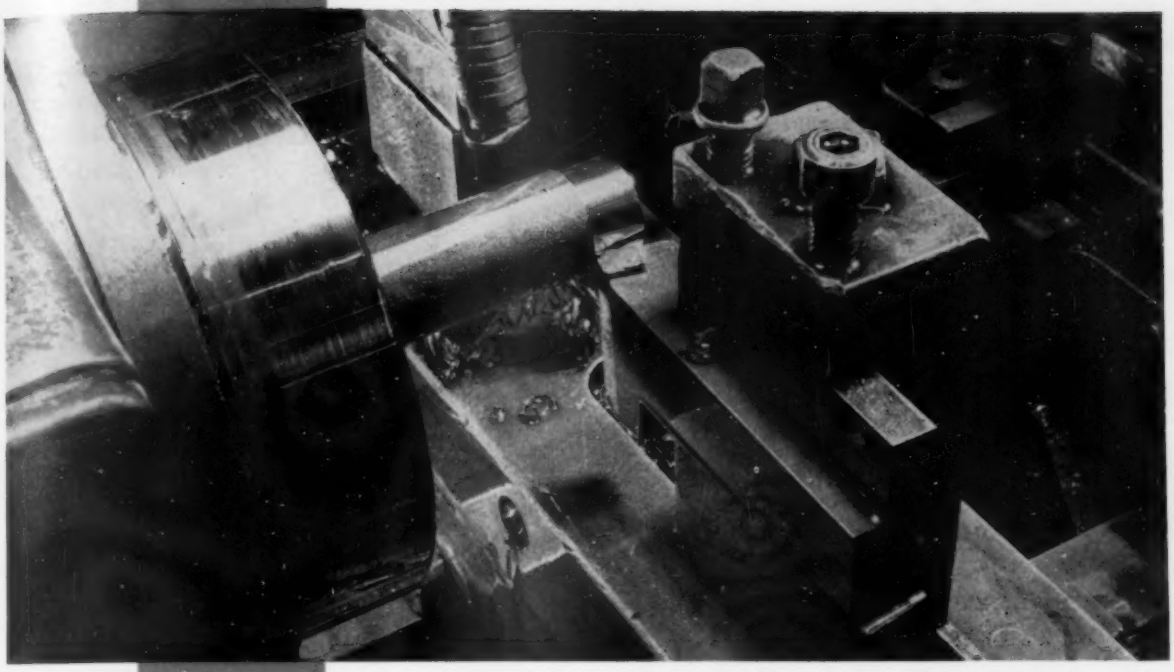


Fig. 1. Typical application of mechanically held insert tool, rough turning stainless steel jet engine nozzles. Brazed tools gave 50 to 60 pieces per grind and a total of 640 pieces per tool life. Converting to a square insert, multiplied that figure to over 30,000 with an average of 2700 pieces between grinds.

How to Get the Most from Carbide Tools

By Edward J. Novack*

Application Engineer
Kennametal, Inc., Latrobe, Pa.

OPTIMUM RESULTS with tungsten carbide tools can be economically obtained only if specific basic principles are observed. These principles can best be discussed individually and include: selection and design of carbide tooling, tool performance, maintenance, inspection, protection and inventory control.

Selection and Design: A competent tool analyst is needed to coordinate the efforts of personnel directly responsible for the selection and design of carbide tooling. He should review all tool requirements before any special tools are designed to determine whether standard catalog tools can be used. Standard tools are usually stock items available for quick delivery. Using standard tools, *Fig.* 1, or adapting to a job lowers operating costs.

The advantages and disadvantages of various types of tooling should be weighed. For instance, it should be kept in mind that the effectiveness of carbide tooling increases when inserts are mechanically held. Such tooling is stress free and can be subjected to more severe cutting operations, *Fig.* 2. Downtime in changing tools is reduced to a minimum and maintenance is far less than that of brazed tools. The indexable features and ease with which mechanically held insert tooling can be resharpened generally makes it superior and far more economical than other carbide types.

The mechanical insert tooling is especially applicable to high production. Ordinary brazed tools require considerable downtime for changing dull tools because the entire tool requires repositioning. With insert type tools, only inserts are changed. The shank remains free. Insert tools can be quickly indexed to present a fresh cutting edge in a mimimum

*Senior member ASTE Detroit chapter

$$\frac{6 \times 33{,}000}$$

Thus, a 1 in. square tool is required

time. Where ordinary brazed tools on high productive setups may take up to three quarters of an hour each time they are changed, mechanical insert tools need only fractions of a minute on single tool setups and approximately one fifth the downtime of brazed tools on multiple tool setups per change. On this basis alone, multiple tooling and high production setups warrant insert type tooling.

Another advantage of this tooling is that it permits use of harder grades of carbide since no brazing stresses are set up in the carbide inserts. While initial cost may be higher, the total cost may be only a fraction of the cost of brazed tools.

Fig. 2. Severe interrupted cut on long cast iron husker roll. Standard clamped tool gives 350 pieces per grind. High-speed steel tools required regrinding after turning only three parts.

Instances arise where tools must deviate from standard types. In such cases the important point to remember is that the tool or tools must fulfill the necessary operational requirements. The tools must be strong enough to resist generated cutting forces and stresses. Adequate size tooling is necessary and usually a heavy tool will do a better job. Important factors influencing the sizes of tool shanks are: overhang of tool, speed, feed, depth of cut, type of material to be machined, and whether the cut is continuous or interrupted, *Fig.* 2.

The tangential cutting force applied on a tool during any machining operation is a direct function of the horsepower consumed in cutting. As power increases, tool pressure increases. For this reason it is advisable to change dull tools at regular intervals to protect them from overloads which can cause failure. A substantial safety factor should be used in choosing or designing tooling to protect it from excessive strains especially on interrupted cutting or where runout conditions prevail. There are several formulas for determining power and loads on cutting tools in operation. One rule is stated as follows: work rate equals the tangential load on the tool multiplied by cutting velocity.

Since:

$$P = \frac{W}{33{,}000}$$

and

$$W = T \times V$$

where:

P = Power consumed, hp
T = Tangential load, lb
V = Velocity, fpm
W = Work rate, ft-lb per min.

Then:

$$P = \frac{T \times V}{33{,}000}$$

or

$$T = \frac{P \times 33{,}000}{V}$$

EXAMPLE: What is the tangential load on a cutting tool when the power consumed is 5 hp and the cutting speed is 200 fpm?

SOLUTION:

$$T = \frac{5 \times 33{,}000}{200}$$

$$= 825 \text{ lb}$$

What is the load on a tool when the consumed power is unknown? An approximate formula can be used for this purpose. Assume 1 cu in. of metal can be removed in 1 min. with 1 hp available at the spindle.

If:

C = Volume, cu in.
d = Depth of cut, in.
f = Feed, in.
K = Relative shear value

Then the volume of metal removed per minute can be found as:

$$C = f \times d \times V \times 12$$

And the approximate formula is:

$$T = \frac{C \times 33{,}000}{K \times V}$$

By substituting a value for C in the approximate formula, a fairly accurate value of tangential load force can be found.

EXAMPLE: With a feed of 0.010 in. per rev, depth of cut of $\frac{1}{4}$in. and velocity of 200 fpm find tangential load set up when cutting mild steel with a shear value of 1.

SOLUTION:

$$C = 0.010 \times 0.25 \times 2400$$

$$= 6 \text{ cu in.}$$

$$T = \frac{6 \times 33{,}000}{1 \times 200}$$

$$= 990 \text{ lb}$$

The same formula can be applied when cutting any material providing the relative shear value of the material is known. The following approximate values can be applied:

K = 1 for mild steel
K = 2.5 for soft cast iron
K = 4 for aluminum

Thus the tool load with respect to various materials can be easily computed. To determine the size of shank required for any tool application, the following formula is applicable:

$$\alpha M_b = SZ$$

where:

α = Rake shear angle value
M_b = Bending moment in tool shank, lb-in.
S = Permissable working stress, psi
Z = Section modulus for bending, in. cu
o = Tool overhang, in.

EXAMPLE: Using conditions of the previous example in which the tangential load was 990 lb, find the dimensions required by a square shank tool where the tool overhang equals the shank depth. Assume a safety factor of 10 (any value from 6 to 10 can be used.)

SOLUTION: Let a equal shank width, depth and overhang in inches.

$$S = \frac{60{,}000}{10} = 6{,}000 \text{ psi}$$

$$Z = \frac{a^3}{6}$$

α = 1 when rake angle equals 0 degree
$M_b = T \times o$

Then substituting in the equation:

$$1 \times 990 \times a = 6000 \times \frac{a^3}{6}$$

$$a = \sqrt{0.99}$$

$$= 1 \text{ in.}$$

Thus, a 1 in. square tool is required.

Load on tool varies with change in rake angle. Approximate values for the rake shear angle value are:

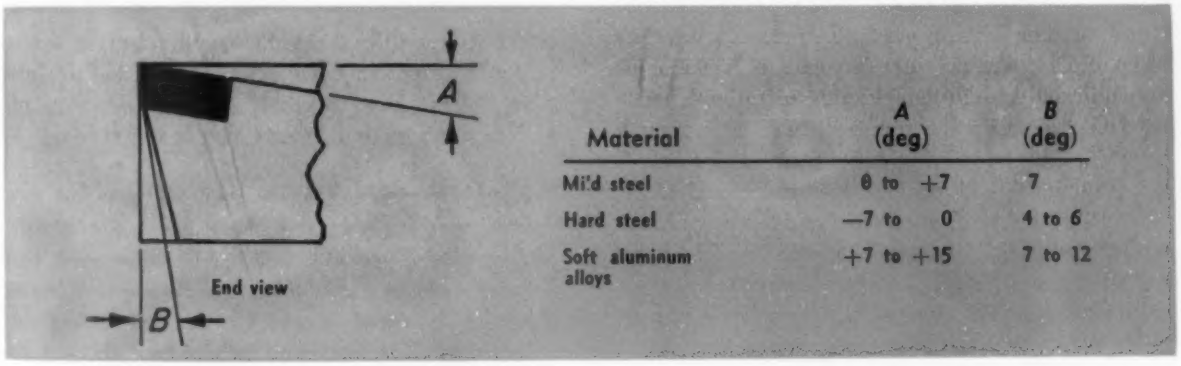
α = 1.30 for —10° rake
α = 1.15 for —5° rake
α = 1 for 0° rake and when speed exceeds 450 fpm
α = 0.93 for +5° rake
α = 0.83 for +10° rake
α = 0.72 for +15° rake

Although the size of the shank required for a specific job is frequently known because of past experience, it is good practice to check tool sizes. When experience is lacking or when comparisons to similar existing setups cannot be made, it is necessary to calculate tool shank sizes.

It is advisable to eliminate close tolerances on tool shanks. Suggested practice is ± 0.005 in. to keep cost of special tooling down. Standard tolerances should be applied wherever possible. This information can be secured from catalogs. Such factors affect overall cost of tooling. Large rake and clearance angles should be avoided, being applied only when necessary. Suggested practice for these angles is shown in *Fig.* 3.

Compound side and back rake angles should be used only when required because they complicate grinding and setup. Tools require shimming after grinding to position them on centerlines of work pieces. Soft free-cutting materials require tools with higher rake and clearance angles for good performance. Harder materials need tools with lower rake and clearance angles for added strength. Extremely high rake and clearance angles should be avoided especially on hard materials or where interrupted cuts are common because such conditions produce shear rather than compression. Because of its physical properties, carbide should be kept in shear wherever possible.

Tools should be designed with adequate shank support beneath carbide tips. Good practice is a ration of one to three. As an example a ¼-in. thick



Material	A (deg)	B (deg)
Mi'd steel	0 to +7	7
Hard steel	—7 to 0	4 to 6
Soft aluminum alloys	+7 to +15	7 to 12

Fig. 3. Recommended tool angles for various workpiece materials in which *A* is side rake, *B* is clearance.

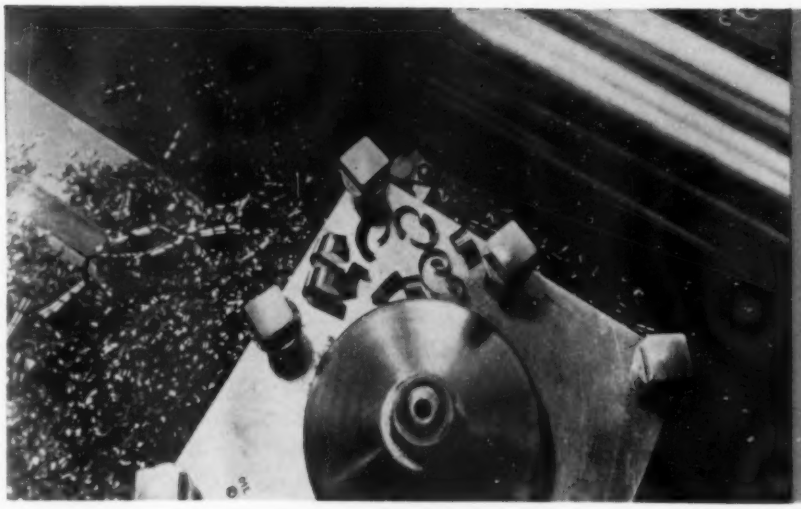


Fig. 4. Turning 105 mm gun tubes—chrome-nickel steel forging—required rigid tooling for heavy cuts desired. Part is turned in only three cuts. Four were required formerly with brazed tools and considerable tool breakage with consequent down time was encountered owing to the irregularity of the first cut, which varies from ¼ to ⅝ inch.

tip requires ¾ in. steel support, making a 1-in. thick shank. There are exceptions to this rule, however, logic should be applied in carbide tool design.

Sandwich braze is recommended especially for intricate form tools. On larger and special shaped blanks, this consists of a 0.005-inch silver solder strip, a 0.010-inch copper shim and another 0.005-inch silver solder strip. The copper shim will help balance out brazing stresses caused by differences of expansion of carbide and steel, as steel expansion is twice that of tungsten carbide. It is advisable to specify higher brazing strength materials for tools when brazing surface area is small or when tools are subjected to high temperature operations. Brazing solder or strip that melts at 1600 F is recommended. This practice is recommended for cutoff and grooving tools tipped with tungsten carbide.

Selection and design of carbide tools require familiarity with different grades of carbide. The basic ingredients of tungsten carbide are tungsten, carbon and cobalt plus additions of titanium, tantalum, or both, to impart the necessary properties.

The cutting grades of carbides fall into three distinct groups. Group one is classified as the edge-wear resistant grades for cutting plastics and nonferrous metals. These grades are basically tungsten and cobalt or tungsten and cobalt plus additions of titanium. The hardness varies indirectly with the amount of cobalt; harder and more wear resistant grades contain less cobalt. Tougher and softer grades contain greater amounts of cobalt.

Group two is classified as the crater-resistant types. Higher percentages of titanium and tantalum or both are added to impart the slippery properties necessary to overcome tool cratering. This group plays an important part in machining high alloy steels. Again the composition determines the toughness and wear properties. The higher the percentage of cobalt, the tougher the carbide and vice versa.

Group three is the intermediate having compositions more or less balanced out. Carbides in this group have crater and edge-wear resistant properties and apply to nonferrous and steel cutting.

The hardness of carbides ranges from 88 to 94 Rockwell A and the transverse rupture strengths vary between 180,000 and 350,000 psi. Tough rather than hard grades should be used on severe cutting applications, especially on jobs with interrupted cuts. The harder and more wear resistant grades should be applied on continuous or lighter cuts. Understanding physical and mechanical properties will aid in selecting carbide grades for a job, will promote economies in tooling and production, and aid in overcoming excessive breakage, excessive wear, or tool failure due to overheating.

Performance: Factors such as machine and fixture specifications and setup affect the overall performance of carbide tooling. Machine tools and fixtures must be rigid, *Fig.* 4, and sufficient power must be delivered to provide for production requirements. The average machine tool delivers 60 to 70 percent of the available motor horsepower to the spindle, with a 40 to 30 percent power loss in overcoming friction in gear train, belting and moving parts. It is well to remember that for all practical purposes 1 hp available at the spindle will permit a metal removal rate of 1 cu in. per minute when machining mild steels. Some alloy steels require as much as 50 percent more power because of their higher tensile strength. Negative rake angle tools require approximately 20 percent more power than tools with neutral or slightly positive rake angles at the lower cutting speeds.

The tool setup man plays an important part in maintaining good tool performance. He should watch tool center height closely especially on small diameters. Good practice is to set tools 1 to 2 percent of work diameter above centerline of spindle. Tools should not be allowed to run to destruction. A

justed, to suit machining conditions, setup, feed and

sults of different grades of carbide. It is also effec-

periodic check for tool wear should be made. Cutting tools should be reground at regular intervals to avoid exceeding 1/32-inch wear land. Intermittent heating and quenching of cutting tools during any machining operation impairs tool performance and may cause heat checks or some form of tool failure. On the other hand periodic honing of tools at the machine should be encouraged. This practice prolongs tool life especially for severe cutting.

Excessive dwell conditions should be avoided, as they create unnecessary wear on tools. Tools should not be allowed to engage work in rapid traverse, since this often results in breakage. Shims should be held to a minimum and then should be properly applied. Single heavy shims are preferred over a number of thin shims for making difference on center height. The use of dog point set screws is advocated for holding down tools. It is also good practice to apply back-up screws for tool adjustment. Regular observance of these rules will invariably improve tool performances.

Speeds and feeds play an important part in securing good tool life and performance. Like any other substance, tungsten carbide tooling also has limitations. Carbide tooling, however, permits much higher cutting speeds than other types. Comparative speed factors of carbides with respect to other cutting tool materials are as follows:

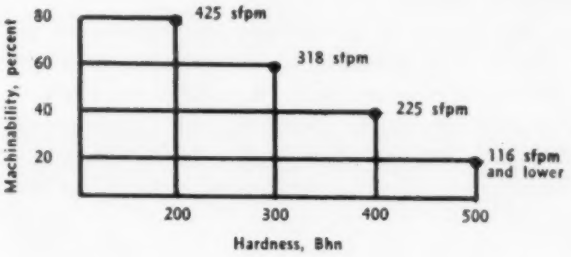
H. S. S. Cobalt	H. S. S. Cast Alloys	Tungsten Carbides
1.0	1.15	1.3 to 1.6	2.7 to 4.5

Materials can be machined with tungsten carbides roughly 3 to 5 times faster than with high-speed steel cutting tools, *Fig.* 2, and good tool life results. This advantage is most significant on high production setups.

Surface speeds for a given job can be determined:

1. From previous experience
2. From trials and tests
3. From speed reference charts
4. From machinability ratings of materials.

The first three methods require no comment. Some emphasis, however, should be placed on machinability ratings of materials. They provide a useful scientific method to obtain optimum machining results, that is, good tool life with good

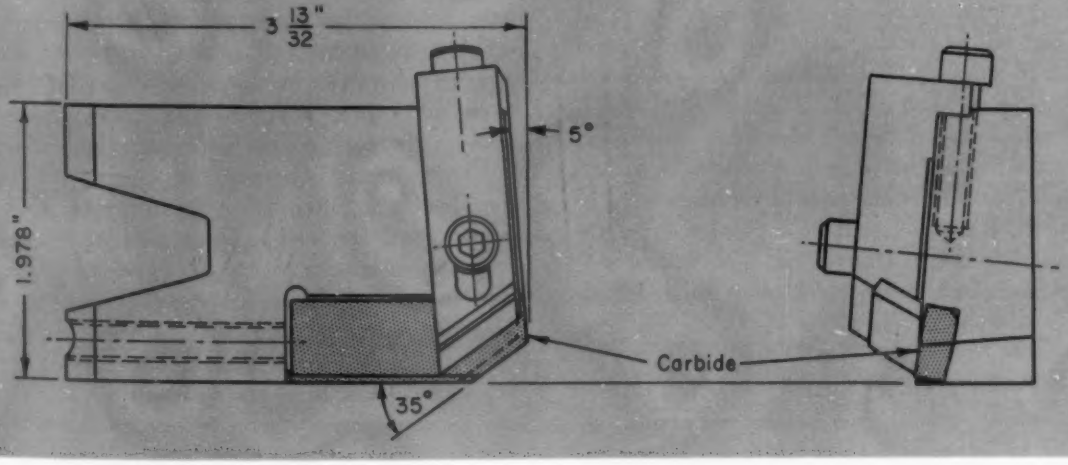


production results. Example: B1112 steel has a machinability rating of 100 percent. It can be machined with high speed steel tools at the rate of 120 to 140 sfpm at approximately 0.010-in. feed per revolution. The desirable speed with tungsten carbide cutting tools for continuous cutting would be approximately 520 sfpm using a speed factor of four for carbide tooling. The speed for cutting any other material can likewise be computed if the machinability rating of that material is known. This information is available in technical handbooks. Lower speed factors are associated with tougher and softer grades of carbide. The higher speed factors are associated with the harder and more wear resistant grades.

In general, the machinability rating of a material decreases as the hardness increases, as illustrated by the graph shown above.

Speed reference charts also indicate this relationship. Suggested speeds should be modified or ad-

Fig. 5. Carbide brazed to insert clamp serves as adjustable chip breaker, eliminates tip breakage and steps up production on special car wheel boring operation. Former wide design required deeper regrinding and caused tip breakage of tool after two or three regrinds.



justed, to suit machining conditions, setup, feed and depth of cut. The feed applied is an influencing factor in computing speeds. When a uniform depth of cut is maintained and it is decided to double the feed, the surface speed should be reduced approximately 33 percent. The resultant tool life will be about the same, but a greater volume of metal is removed in a given time and the overall production is increased.

Higher surface speeds and lower feeds are associated with automatic machine setups due to the number of tools involved. Most automatic machine tool builders design equipment on this principle and it is an advantage in that harder grades of carbide can be used, lower tool pressures applied and horsepower requirements decreased.

Usual job shop practice calls for lower speeds and higher feeds permitting tougher grades of carbide to be used and higher metal removal rate for a given tool life. In most cases experience will dictate the speed to use. For interrupted runout conditions it is advisable to use conservative speeds and feeds with tougher grades of carbide. Running a job dry instead of with a coolant will necessitate a change in speed. Good flow of coolant is advocated as it permits higher surface speeds.

The governing factor on cutting speeds is tool life. High cutting speeds and frequent tool changes can result in poor production unless a quick change of tools can be made such as is possible with insert type tooling. If tools dull prematurely and show excessive edge wear, cutting speeds should be reduced. On the other hand if tools show excessive crater, speeds should be increased and the feeds decreased.

The use of coolant is recommended with carbide tooling because it promotes better tool life. In some instances, it is difficult to apply coolants. Then it is desirable to apply a jet air stream directed at the cutting point of the tool. Some of the more recent innovations, such as carbon-dioxide, or atomized coolants introduced by a forced jet air stream prove effective in machining titanium and titanium alloys. With the common coolants of emulsified oils and water, a mixture of forty parts of water to one part of soluble oil is recommended. Many materials such as plastics, cast iron, wood, resin impregnated cloth and aluminum require no coolant. When excessive heating results from cutting these materials, some form of coolant should be introduced, either a liquid or a gaseous type. On small single point tool threading applications, sulfurized base oils help maintain good size and good tool life when threading steels of 300 to 390 Bhn.

Tool Performance Control: A record of tool performances, especially on productive setups, enables the tool specialist to compare machining results of different grades of carbide. It is also effective in determining inventory requirements covering production needs.

Since good tool life is a production requirement, it is important that the proper grade of carbide be used. An analysis of past performance results will indicate the grade of carbide for a job. Such records will also be valuable in holding the normal wear land to $\frac{1}{32}$ in. The records should be such as to bring to light abnormal breakage or excessive wear conditions so they can be investigated immediately. Periodic maintenance of machine equipment will improve performance. An analysis of machining conditions will help in correcting breakage. In many cases machines are allowed to become loose and worn, and poor machining results reflect on the performance of the tooling.

Fig. 6. Grinding chip breaker in standard insert turning tool on conventional surface grinder. The wheel is 10-inch dia x ¼ in. face, 220-grit resinoid bond diamond type. Forty to sixty table passes per minute, and not over 1/3 of a thousandth inch per pass vertical feed assure rapid, safe grinding.

Variations in the hardness of the materials being machined also often affect performance. Exessive runout conditions and scaly surfaces tend to reduce tool life. Measures to correct these conditions result in improved performances. Improper chip breakers reflect on tool life. Narrow, deep chip breakers set up heavier loads and can result in tool breakage. Chip breakers designed to fit the job can be an important factor in lenghtening tool life. *Fig.* 5. Improper nose radii have a harmful effect

on tool life. Small nose radii should be avoided on interrupted cuts. A good rule for determining nose radii on carbide tools is that they should be roughly 3 to 4 times the feed.

If the speeds and feeds of a machine are fixed and excessive tool breakage occurs, then a softer grade of carbide should be tried. If excessive edge wear is encountered and speeds and feeds cannot be changed, then it is necessary to use a harder and more wear resistant grade of carbide. Regular investigation of specific machining conditions will invarably promote better tool performance.

Tool Maintenance: When reconditioning dull carbide tools, sharpening may be either by offhand grinding or by machine grinding. *Figs.* 6 and 7. Wheels should be free cutting, well dressed and true running at all times. Lighter grinding pressures result in better surface finishes on carbide tools and will also extend the life of grinding wheels. Wet grinding is desirable wherever possible, *Fig.* 7. It will reduce heat checking and crazing. Proper grades of grinding wheels are important. A 60 to 80-grit silicon carbide grinding wheel of a soft to medium hardness is recommended for offhand work.

Glazing of carbide tools indicate a hard grade of wheel being used or that there is a loading effect on the wheel. Dressing the wheel or using a softer grade will overcome the condition. Glazed surfaces on carbide tools will show heat checks or cracks under a high power glass. Tools in this condition perform poorly in production.

It is good practice to finish grind carbide tools on a 150 to 180-grit diamond wheel of vitrified bond. This applies to offhand grinding only. Diamond wheels of 50 or 100 concentration can be used. As a higher concentration is preferred and is especially applicable in grinding nose radii. Tools which are used to machine steel for interrupted cuts, runout condition, etc., should be honed to remove feather edges. Honing improves performance especially on severe machining applications but is unnecessary on tools cutting cast iron, plastics and other soft materials. Keen edges should be maintained for these materials.

Surface grinding or any form of fixture grinding should be done with resinoid type diamond wheels. These wheels are free cutting, but they are expensive. Mineral oil, kerosene or prepared coolants extend the life of diamond wheels, keep them clean and retard loading.

Steel shanks should not be allowed to touch the grinding surface of a diamond wheel as the steel tends to pull out the diamond particles of the wheel. Hardened steel blocks can be used for dressing diamond wheels. This job should be done only by an experienced operator. Frequent dressing of diamond wheels should be discouraged. Emphasis should be placed on use of lighter grinding pressures.

Inspection, Protection and Inventory Control: These functions are essential in securing good tools and the right number of tools to keep a production job running satisfactorily. Tool inspection methods should be adequate, and inspection instructions strictly enforced. After tools are inspected, the good ones should be protected by wrapping with masking tape or dipping in a strippable plastic coating to protect cutting edges. The protected tools can then be shelved until needed.

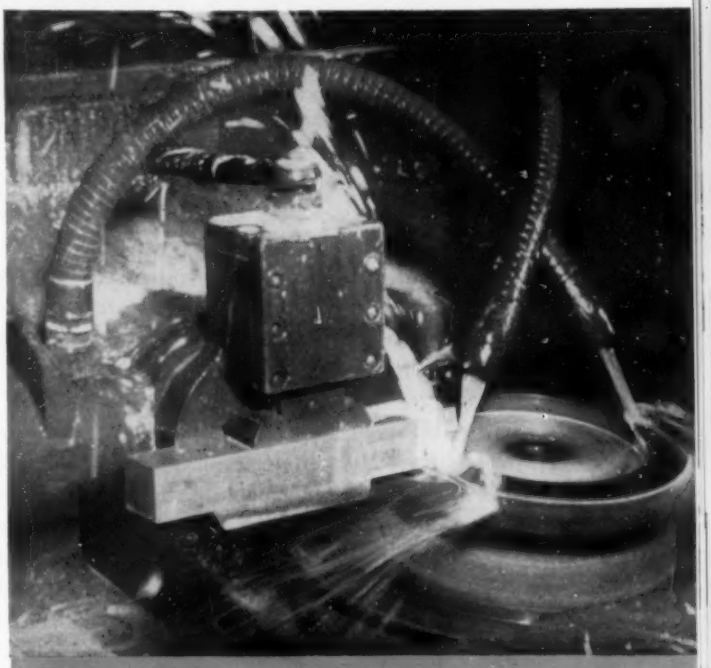


Fig. 7. Emulsion coolant effectively applied in carbide grinding. Single point carbide tool is being sharpened in automatic operation with 6-inch diamond cup wheel. An oscillating motion grinds the entire tip surface.

Cutting edges of all carbide tools should be protected to insure against chipping and breaking in transit. The tool inventory control function insures adequate tooling at all times. It maintains records of usage, frequency of usage, float, maximum-minimum requirements, accepted tooling and associated performance tests, initial cost and end cost of tooling.

To obtain the best results with tungsten carbide tools requires an integrated tooling program to insure proper selection and design of tools, correct application of tools, timely maintenance and adequate inspection. Long tool life, economical production and well finished products are the rewards.

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Stop for Tracer Lathe

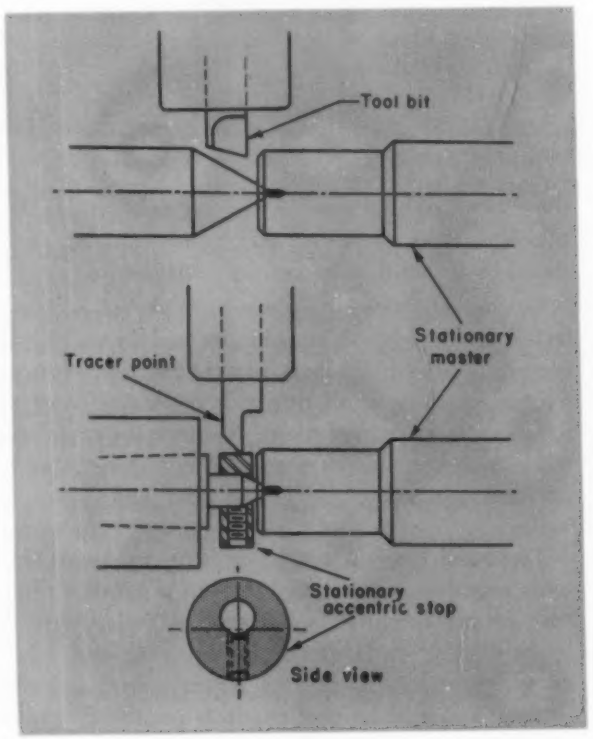
Positioning the tool at a tracer lathe beyond the end of a bar prior to the start of a cut often resulted in banging the tool into the workpiece center damaging the carbide tipped toolbits.

Adding a shoulder to the end of the masters was not a satisfactory solution as the same master was often used on several different jobs by improvising.

The eccentric stop shown in the accompanying sketch serves the purpose admirably. Alterations involved simply grinding down existing centers to fit the hole in the stop. The stop itself is made in several sizes to accommodate the full range of work and consists of a piece of round soft steel with a hole reamed off center and a tapped hole for a setscrew.

In use, the setscrew is loosened, and the eccentric rotated until the diameter is reached that will control the lateral movement of the tracer point to keep the toolbit clear of the workpiece center and position the tool to begin its cut.

B. F. Greenwood
Detroit Chaper



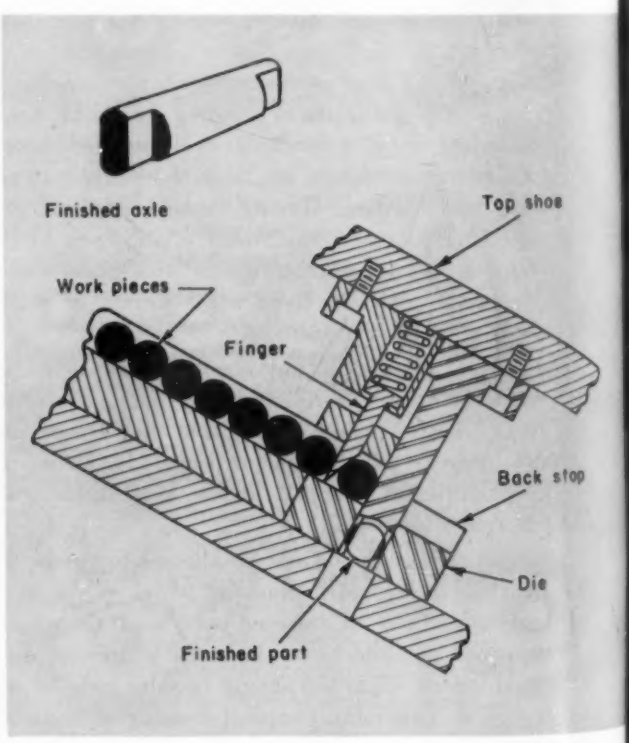
Shearing Die

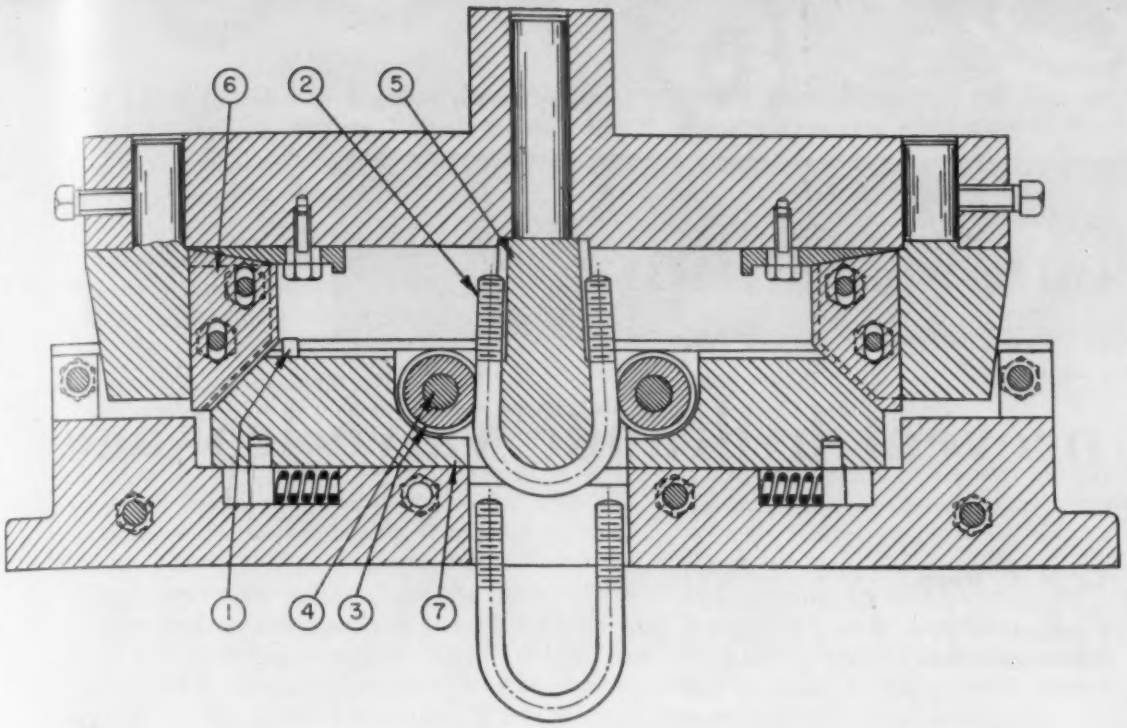
Axle shafts being manufactured for track rollers required flats on both ends aligned with each other for proper assembly. To produce the parts economically in quantity the press setup shown in the accompanying illustration was devised.

The die, View A, was shaped to the cross-section dimension desired in the finished axle, View B. The operation is performed as follows: The shaft blanks, cut off to the required lengths, are fed through an inclined chute to the die which allows the workpiece to roll into position against the back stop. A spring controlled finger holds the work against the stop. The punch, of concave shape to grip the piece, forces it through the die, shearing flats on both ends at the same time.

On the upstroke of the press the next blank rolls to the stop with the aid of the finger. It operates through a guide slot in the plate block which holds succeeding workpieces. The press is inclined for feeding purposes; the operator keeps the chute filled with blanks. Scrap is blown off by air.

Charles Spicer
Grand River Valley Chapter





Combination Punch and Die

Much difficulty was encountered bending an automotive U-bolt on a simple bending die.

The two legs of the U-bolt were not formed parallel, i.e. bent 180 degrees, because of springback of the material, resulting from its residual resiliency. To overcome the springback required bending the work to an angle larger than the angle wanted and this necessitated designing a combination punch and die. The one shown is a practical combination tool which secures the desired results in one operation.

The workpiece is located against the stop *(1)*, on the sliding steel blocks *(2)*, in a half-round groove. Two hardened steel rollers *(3)*, which turn on steel axles *(4)*, serve as variable form blocks. When the ram descends, the punch *(5)*, bends the bolt up 180 degrees. As the ram continues downward a short distance, the beveled steel blocks *(6)*, fastened to the punch holder, come in contact with the beveled sliding blocks *(2)*, moving them inward against the center so the U-bolt *(7)*, is bent more than 180 degrees as shown. When the ram retracts, the U-bolt springs back to parallel position and falls down to a receptacle for finished parts. To provide proper amount of spring back, the die can be adjusted.

Hjalmar Dahl
Upplands Vasby, Sweden

Radii Gages

When small production runs of castings and similar parts are laid out for machining and drilling, a considerable part of the work consists of scribing holes and radii. In most shops certain standard sizes of holes reoccur quite frequently. The simple device shown was devised to eliminate the necessity for constant setting and checking of dividers.

It consists of an old annealed or hard power hacksaw blade. By making the distance between the two sharp points the required radius a fixed setting compass is obtained. By making up a number of these of different sizes the most commonly used radii are readily obtained and kept at hand on the layout bench.

P. H. Winter
ASTE Syracuse Chapter

threadless subplates

prevent hydraulic valve leakage

By R. C. Hupp

President
Hupp-Lapeer, Inc.
Lapeer, Mich.

SINCE WORLD WAR II, there has been an increasing trend toward the use of gasket mounted valves in the hydraulic circuits of machine tools. This trend has reached such proportions that gasket mounting is now considered standard practice for valves up to 1¼-in. nominal pipe size; particularly on machines built to Joint Industry Conference (JIC) standards.

This article will discuss some of the problems that have been encountered in gasket mounting, and a new development—threadless or insert construction, *Fig.* 1—that prevents most of these difficulties.

Previous to gasket mounting, it was customary to tap pipe threads for piping connections directly into the hydraulic valve body. A typical four-way directional valve had pipe-tapped circuit connections in the top, bottom and front faces of the body with the back left clear for attachment to a support. Removing and reinstalling threaded body valves is time consuming because of the many connections that must be broken and remade.

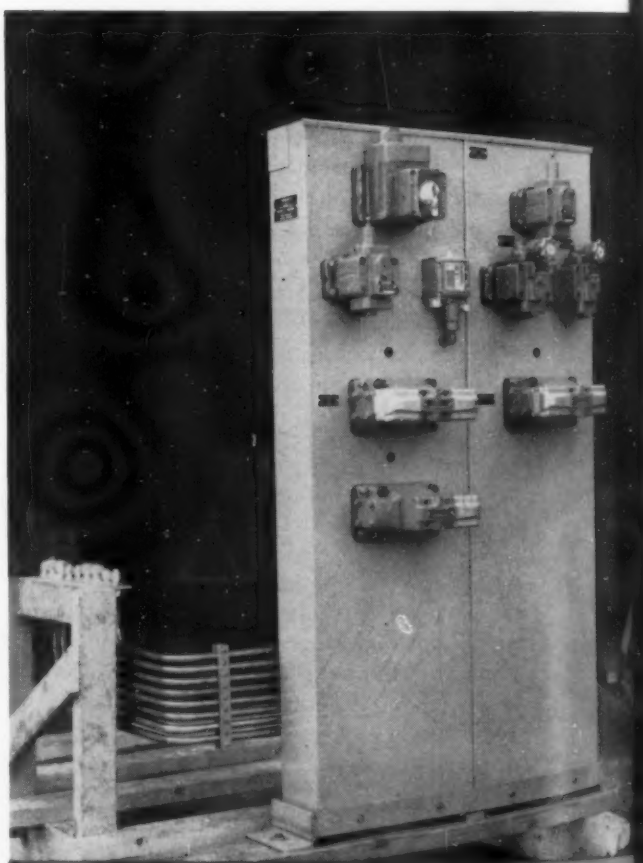


Fig. 1. Hydraulic valves can be neatly grouped on panels by using inserts and threadless subplate construction.

Gasket Mounting

Subplate or gasket mounting of valves was developed to simplify hydraulic valve maintenance and is designed so valves can be removed and replaced without disturbing piping connections. This is possible because all fluid ports of the valve are on one face of the body. This face is ground flat. The valve is bolted to a flat, thick subplate that has fluid ports corresponding to those in the valve. A

fluid seal is provided by a gasket placed between the valve body and subplate. Ports in the exposed face of the subplate have female pipe threads for the circuit connections.

Advantages: Although ease of maintenance was the principal impetus behind the development and acceptance of gasket mounted valves, use of this construction has brought to light other advantages, which are perhaps more important. Valve manufacturers have benefited because the difficult tapping operation has been shifted from the complex valve body to the flat subplate. This has simplified the tapping operation and has reduced scrap losses due to bad threads. When pipe threads become damaged or worn in use it is only necessary to replace the subplate; not the entire valve.

Valve performance has been improved because valve body distortion caused by taper thread make-up is avoided. Distortion can be serious because it leads to sticking of the valve spool. When threads were cut in valve bodies, distortion was caused if pipe fittings were wrenched excessively as in positioning elbows or curing leaks.

Weaknesses: The subplate type of construction is a big improvement over previous practice but has not eliminated all the problems of hydraulic valve mounting. In fact, gasket mounting has introduced several new problems. It is inherent in this design that all fluid ports be in one face of the valve body. This often means that ports are inconveniently crowded together severely limiting the use of elbow fittings at the subplate outlets.

Since the subplate forms an element of the hydraulic seal between the valve body and piping, it must not be porous. Subplates, however, are usually made of castings and they are subject to porosity leaks even when made of dense semi-steel alloys.

Gasket mounting avoids the difficulties of cutting pipe threads directly in hydraulic valve bodies but it does so by sweeping the basic problem under the rug. Female pipe threads, the nightmare of high pressure hydraulics, have not been eliminated. They have only been pushed back a little by moving them from the valve body to the subplate.

Threadless Subplates

The development of a threadless subplate, *Fig.* 2, was stimulated by the necessity of pad-mounting hydraulic valves on cast gray iron, which is too porous to form a dependable seal for oil under high pressure. To circumvent the iron porosity, an experimental plate was designed that separated fluid sealing from mechanical functions. This plate had the usual bolting pad for valve mounting but steel inserts for fluid passages.

Final development of this design, on which patents have been applied for, differs from the experimental model in only one important respect. Originally, the hexagonal insert heads were recessed into cored and counterbored hexagonal openings in the face of the subplate. In the final design, a thin plate with hexagonal openings is fastened to the face of the subplate to avoid difficult, multiple counterboring operations. Each counterbore previously had to be the same depth to close tolerances.

During development of this subplate it became apparent that preventing porosity leaks was a relatively minor advantage of the plate-insert combination. The big featurs is that there are no pipe threads in the subplate itself and they, along with

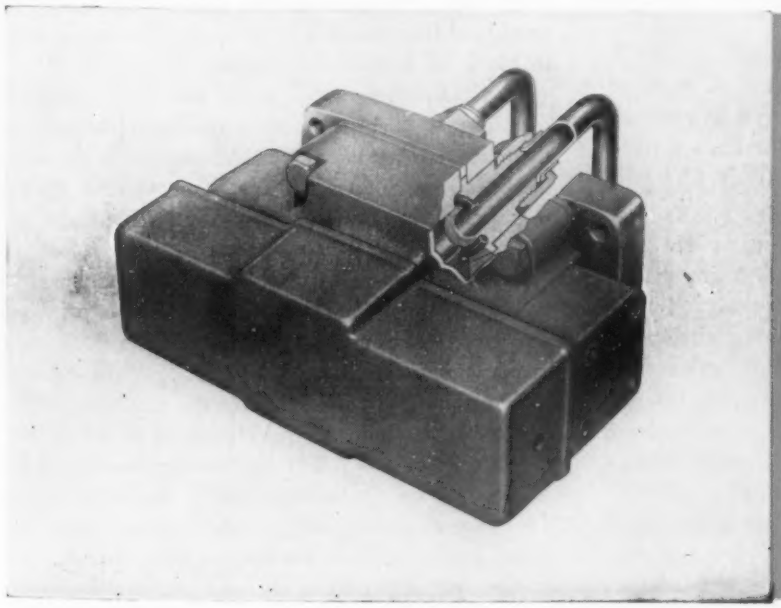


Fig. 2. Hydraulic valve assembled with its associated tubing through steel inserts positioned in an individual mounting pad. Seal is obtained by the O-ring.

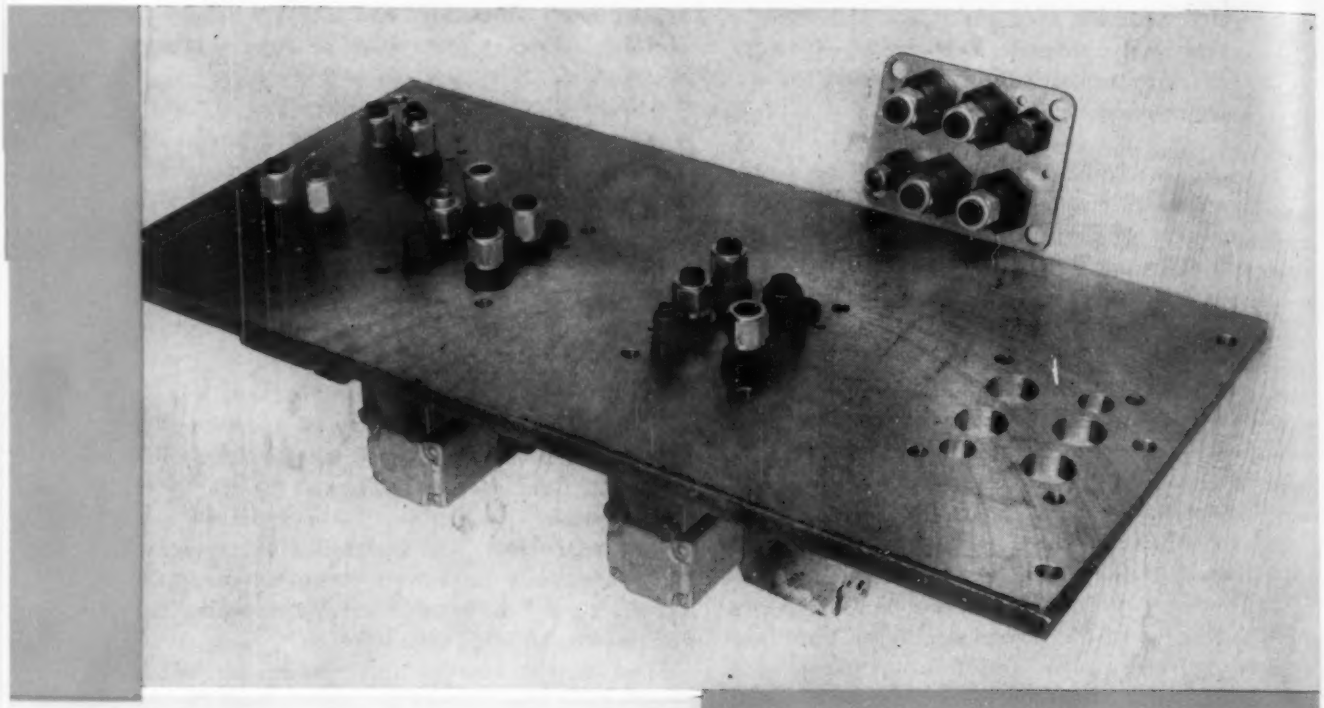


Fig. 4. (above) Maximum savings can be realized by companies that produce their own threadless subplates. Case plates, such as that shown, offer sufficient structural strength and conveniently group valves.

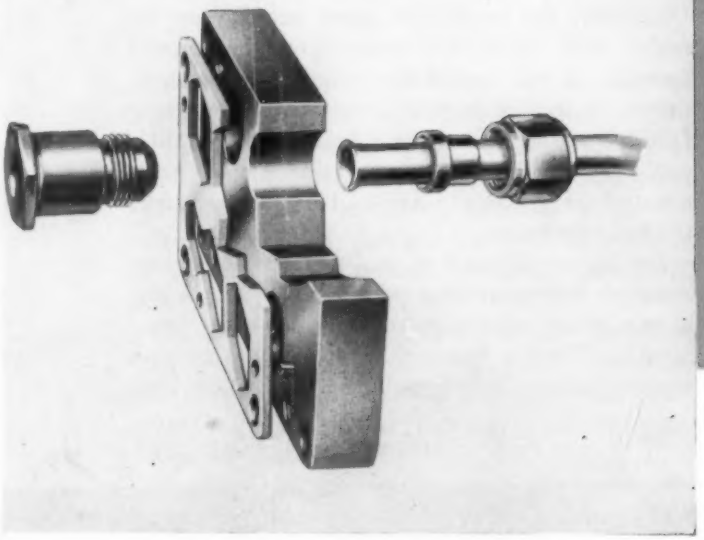


Fig. 3. Exploded view shows the basic parts of a threadless subplate connection. The steel insert is placed through the hexagonal hole in the lockplate and through the hole in the subplate. With the insert in position, the joint is made up from just one side of the subplate.

conventional tube connector bodies, can be omitted entirely by machining tube connector ends directly on the inserts.

Elements of Threadless Subplates: Threadless subplate construction comprises three basic elements: subplate, inserts and lockplate, *Fig.* 3. The subplate is a relatively thick casting that provides a mounting pad for the hydraulic valve and at the same time holds and positions the inserts with respect to the fluid ports in the valve body.

The inserts are screw machine parts with axially drilled holes for passage of the fluid. They have a hexagonal head with gasket sealing face at one end and some means for connecting to the piping at the other end. The cylindrical body of the insert locates it in a drilled hole in the subplate. Inserts can be made with male pipe thread, female pipe thread or machined tube connector ends, or they can be solid to block off unused valve ports.

The lockplate is a thin metal part with hexagonal openings that engage the insert heads to prevent them from rotating. Since the lockplate is the same thickness as the insert heads, it provides a mounting surface flush with the gasket sealing face.

Advantages: The threadless subplate has certain advantages that apply to the three principal phases of machine tool hydraulics: design, fabrication and maintenance.

The plate-insert design gives the machine designer greater latitude in the choice of location, material and surface finish for valve mounting pads. All machining operations can be performed from the valve mounting face of the pad since no provision has to be made for back-tapping pipe threads in the rear face. Porosity and surface finish re-

quire no special consideration since the pad is not subjected to direct hydraulic oil pressure. Any standard material, including cast gray iron, can be used, and any standard machining operation, such as milling, planing and grinding, will provide a satisfactory surface finish.

Inserts with integral tube connector ends, *Fig.* 4, make possible important savings to fabricators of machine tool hydraulic piping installations. The time required to tighten many male connectors is entirely omitted and the amount of projection beyond the plate is reduced, which leaves more space for the piping. When several valves are grouped on a panel this gain in space can substantially simplify the over-all installation.

Having the insert and tube connector in one piece also avoids a joint at each outlet and a possible source of leakage. When conditions require that pipe threads be used at the plate outlets, they are in individual inserts and are individually replaceable if they become unserviceable for any reason. Also, since the insert can be tightened from the hexagonal head end, it is practical to use elbows in adjacent ports where the center distance is insufficient to swing the elbow itself.

To the ultimate user, *Fig.* 5, the threadless subplate offers advantage by preventing porosity and pipe thread leaks that can be persistent and elusive. Often such leaks show up only after a hydraulic system has been in service for some time.

Mounting Pad Layout: The basic elements of mounting pad layout for use of threadless inserts are: (1) spacing of ports and mounting bolts, (2) thickness of plate required and (3) flatness and finish required on the mounting surface. Port

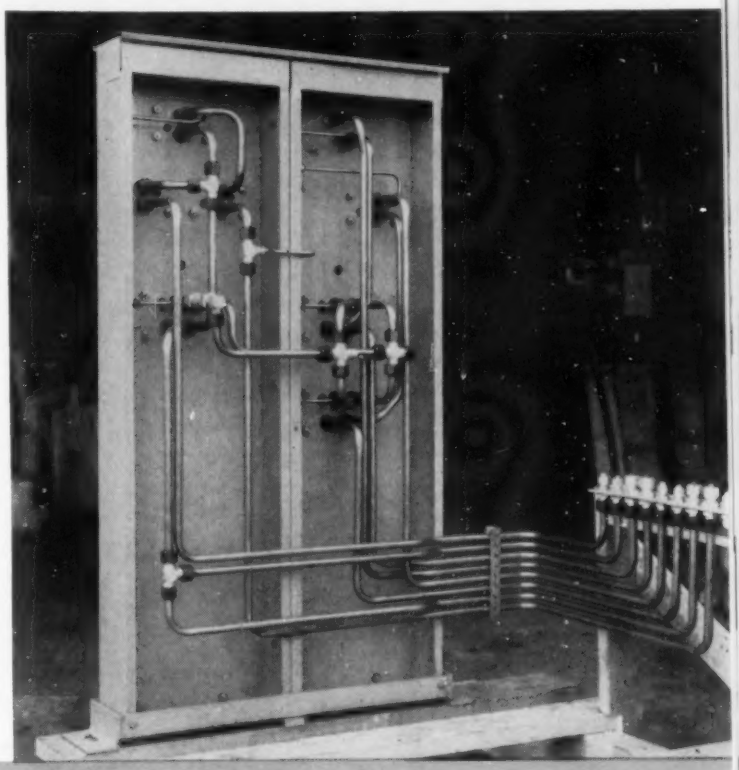


Fig. 5. This special valve panel, reverse of *Fig.* 1, shows the complexity of piping that can be easily achieved with insert construction. Each valve has a mounting pad and all pads are grouped on a sheet metal panel. Possibility of using several elbows per valve is also illustrated.

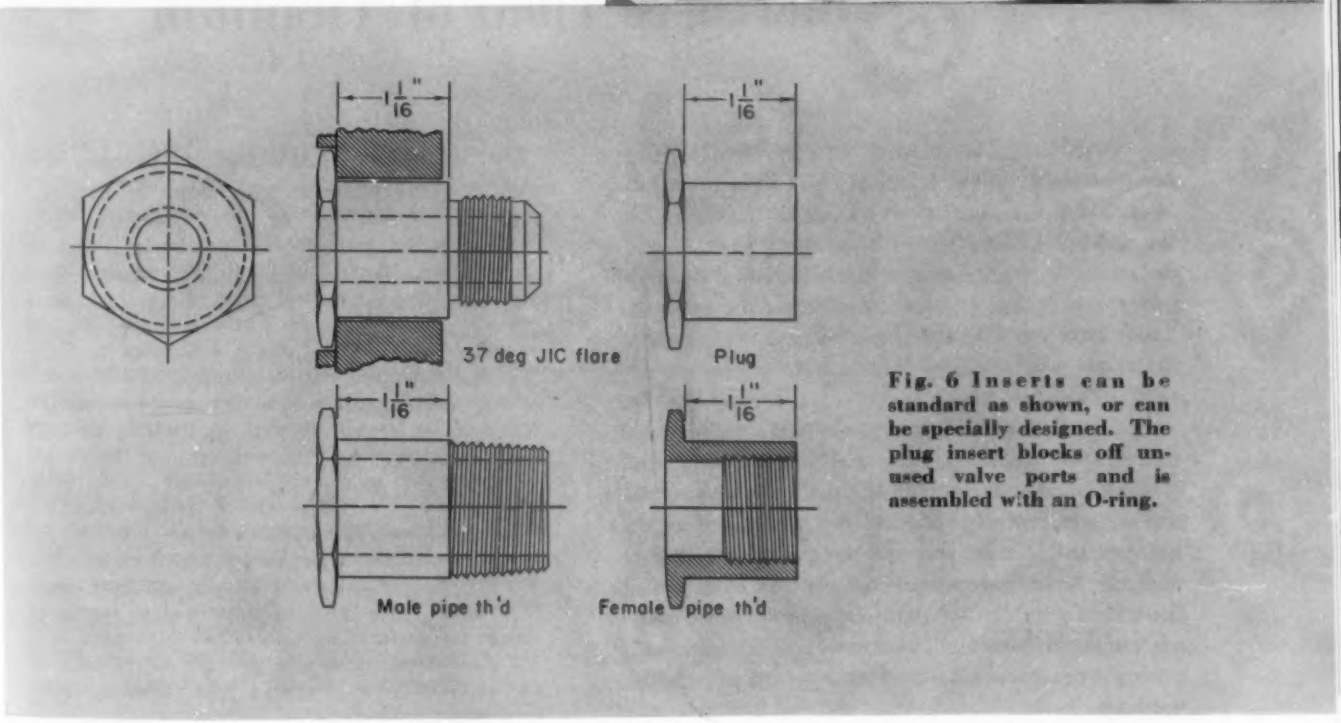


Fig. 6 Inserts can be standard as shown, or can be specially designed. The plug insert blocks off unused valve ports and is assembled with an O-ring.

and bolt spacing are governed by the valve to be mounted. Pad thickness depends on recommendations of the valve manufacturer and is a function of such variables as: operating pressure, area subject to hydraulic pressure and bolt spacing. Generally, for valves up to ¾ in. nominal pipe size, mounting plate thickness will vary from ¾ in. to 1⅛ in. These plates are used with pressures from 500 to 2000 psi.

Flatness is the only critical dimension for a threadless mounting pad. Spool clearance in a hydraulic valve body is of the order of 0.0005 in. and it is important that no distortion be produced in the body when fastening it to the plate. The variation in flatness should not exceed 0.001 in. over the mounting area of individual valves.

Since the insert provides the sealing face for the gasket, surface finish of the subplate is not critical. Any surface that has the required flatness will be sufficiently smooth. When it is desirable to specify the finish, 125 microinch rms maximum roughness should be called for.

Insert Selection: Insert selection is based on the port size of the valve to be mounted, the outside and inside diameters of the corresponding O-ring, and the center distance between adjacent ports. The valve port size determines the basic insert size, but the insert used may be larger or smaller. The hexagonal flat dimension of an insert should be at least 3/16 in. larger than the outside diameter of the gasket used. The maximum size of the hexagonal head is limited by the centerline distance between adjacent inserts. The bore size of the insert is determined by the type and size of piping connection specified but in any case should be at least ⅛ in. less than the outside diameter of the gasket used.

Dimensional standards for inserts have been set up to give the same relationship of nominal tube and pipe thread sizes to body hexagon size as apply with AN 815 and AN 816 fittings. Special inserts are also available. The four standard types of inserts are shown in *Fig.* 6. Lockplates correspond to the mounting pad layout and are available for all JIC type valves.

Threadless or insert mounting of hydraulic valves, by separating the fluid sealing from the mechanical functions in the subplate, offers definite advantages in the design, fabrication and operation of hydraulic circuits. It avoids pipe threads and porosity encountered with conventional mountings. This increases the flexibility and should widen the use of gasket mounted hydraulic components.

Melting Process Increases Yield of Titanium

DEVELOPMENT OF A NEW MELTING PROCESS has been brought to the attention of producers of titanium and titanium alloys by one of the leaders in the field, Mallory-Sharon Titanium Corp. It produces ingots with superior characteristics to methods presently known, and in addition increases the "yield" of metallic titanium from its sponge raw material, which is now increasingly difficult to obtain.

Previously, two different methods have been used by various producers—arc melting and induction melting. Though both methods had advantages, neither was entirely satisfactory; arc melted ingots are not sufficiently homogeneous, while induction melted ingots have a carbon content that makes them undesirable for many applications. Results of initial production of the new process have suggested it combines the best features of the two older methods.

The advantages of this melting process, designated by Mallory-Sharon as Method "S" are:

1. Ingots are homogeneous and display the same characteristics throughout. Thus, for example, there are no variations in a sheet rolled from a single ingot. Ingots of a given type are reproducible, and the size and shape can be varied over a wide range.
2. Carbon content can be controlled exactly to any amount specified and held as low as the amount inherent in the sponge material. A titanium electrode is used in place of a carbon electrode, and the melting is accomplished in a crucible made of copper, which is water cooled. With no carbon contamination, machining and welding characteristics are improved and impact strength is increased.
3. The yield is increased markedly, and more metallic titanium can be produced from a given amount of sponge raw material since scrap loss is reduced. This is a prime factor in view of the high cost of titanium and of the scarcity of sponge, now a limiting factor on titanium production.

New Dynamometer Drive Extends Testing Possibilities

and is another source of adjustable speed

By

E. H. Fredrick

Chief Application Engineer
Dynamatic Corp.

and

M. F. Gay

Motor & Generator Section
Allis-Chalmers Mfg. Co.

INVESTIGATION of the type of variable speed drive required by a large dynamometer has resulted not only in production of a successful dynamometer, *Fig.* 1, with many industrial uses but also in development of a solidly mounted adjustable speed drive requiring minimum floor space at the driven machine. Currently in operation, the new type dynamometer is testing torque converter-type transmissions used in heavy military tanks.

This type of drive is best suited for application where: (1) the torque at reduced speeds does not exceed the torque at full speed, which is true of most drives; (2) the speed range below the 60 cycles synchronous speed of the drive motor is not greater than approximately 10 to 1; and (3) the maximum speed is relatively high. Motors, gasoline and diesel engines, generators, blowers, compressors, centrifugal pumps, hydraulic pumps, differentials and many varied aircraft components are typical of the devices that can be tested on the new dynamometer.

This dynamometer measures power input to the equipment under test with high accuracy. The magnitude of power input is obtained by taking simultaneous readings of input torque and input speed. These readings can be taken visually or photographically. The latter method is followed when a number of pressure, speed, temperature and equipment output readings are taken simultaneously with the readings of input conditions.

The indicating instruments are grouped at a central location where an operator also has complete control of the test conditions and dynamometer operation. Readings are taken to obtain: (1) the efficiency of the equipment being tested at various speeds under particular operating conditions;

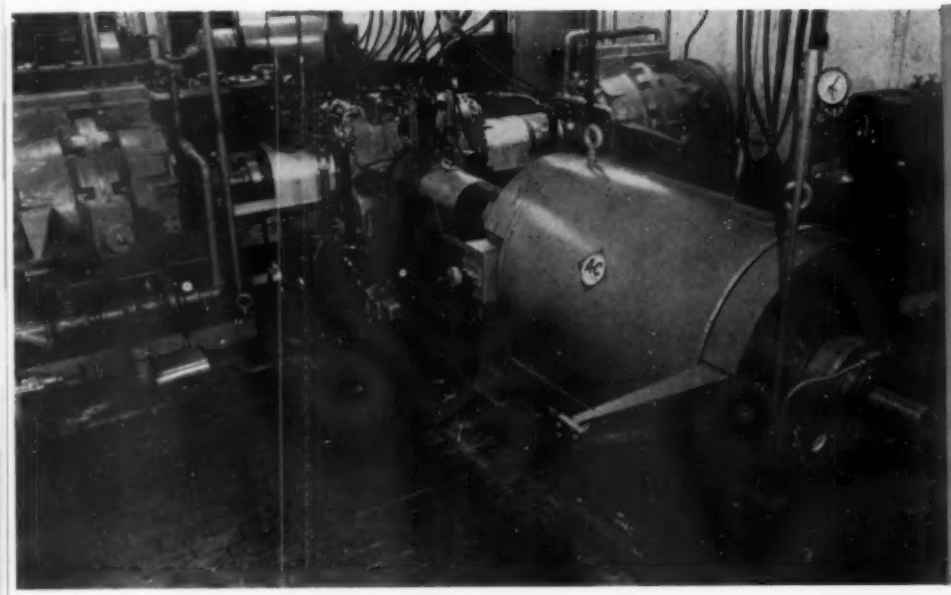


Fig. 1. Set up for test of a heavy tank transmission, the 900-hp, 1150-v, 3180-rpm variable speed motoring dynamometer, foreground, is used with two absorbing dynamometers, right and left background.

(2) efficiency at a fixed speed with various operating conditions; and (3) operating performance over a period of time at a set speed and particular operating conditions.

The ease in obtaining test data and controlling the dynamometer operating conditions reduces testing time to a minimum. Equipment on test can be rated more nearly to its actual capacity than was previously possible because of the accuracy of torque and speed measurement. In production testing, the actual time required to test each unit is kept to a minimum by using snap-on fittings, flexible couplings and jacks for setting up, dismantling and aligning the equipment on test.

Drive Characteristics

Selecting the type of drive for this dynamometer posed many problems. It had to be sensitive, develop up to 900 hp at 3180 rpm and maintain constant torque capacity down to 350 rpm. Major considerations governing the type of drive selected were: reliability, simplicity, performance, first cost, maintenance cost and flexibility in operation. After a careful study of the factors, a variable frequency drive appeared to have many advantages and offer the best solution.

Dynamometer Motor: Since the load-curve characteristics required would be ideally met by a variable frequency induction motor, a relatively standard 1000-hp, 3580-rpm, 60-cycle squirrel-cage motor was selected as the dynamometer motor. The required maximum speed of 3180 rpm is obtained at 54 cycles. The speed range is covered by varying the frequency from 54 to 10 cycles, which is a conservative range of operation for a well-designed variable frequency system.

Fig. 2. Major components of the motoring dynamometer are shown in this block diagram.

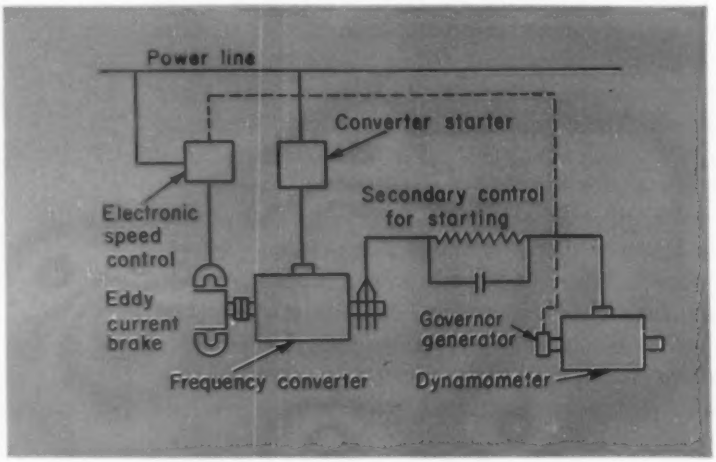
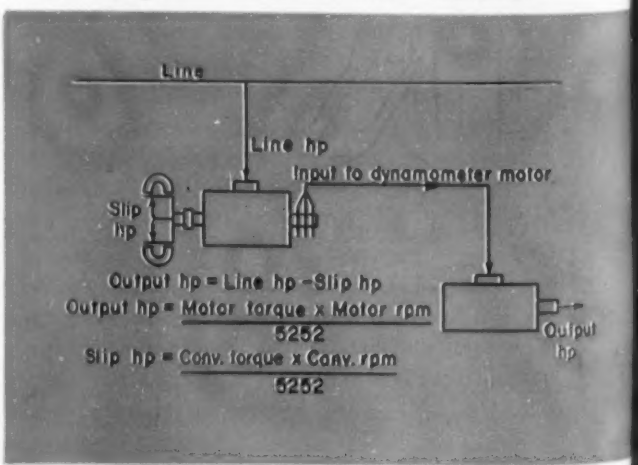


Fig. 3. While motoring, power flows through the various components in the directions indicated.


Line
Line hp
Input to dynamometer motor
Slip hp
Output hp = Line hp - Slip hp
Output hp = Motor torque x Motor rpm / 5252
Slip hp = Conv. torque x Conv. rpm / 5252
Output hp

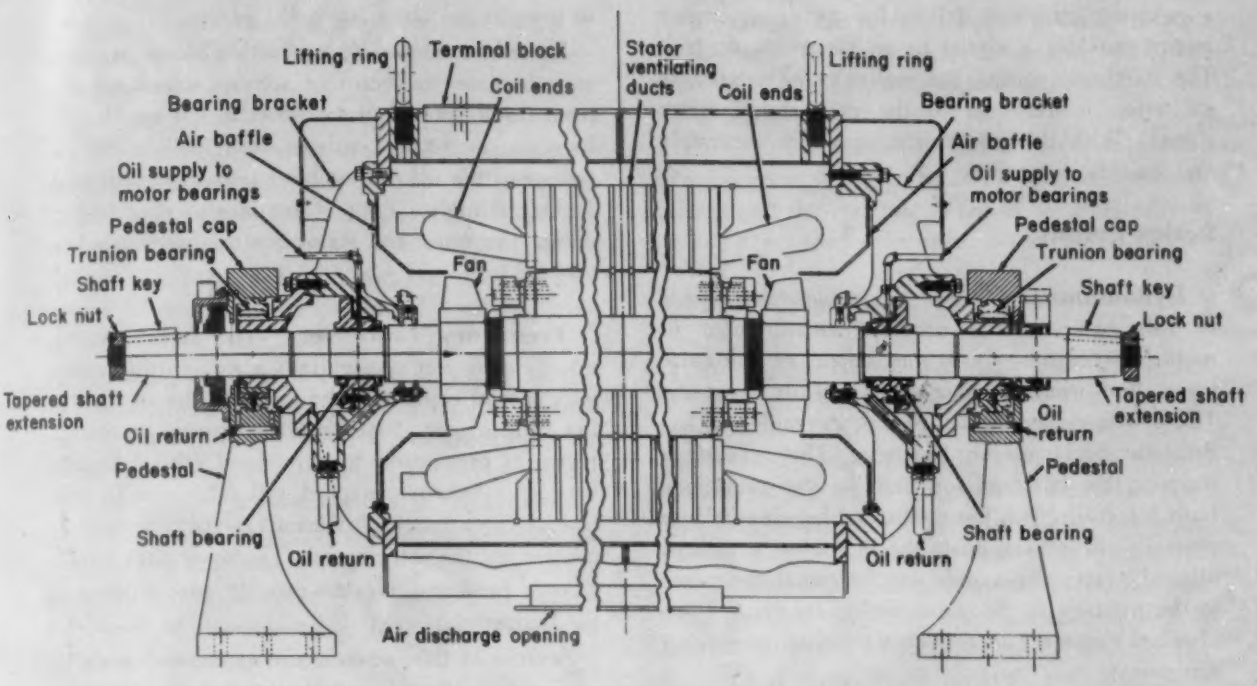


Fig. 4. Construction details of the motoring dynamometer are shown in this cross-section drawing.

Induction Frequency Converter: Because operation at or close to 60 cycles is not required, a 1250-hp, 4-pole induction frequency converter was selected as the most economical source of variable frequency. In the required range of operation, converter speed is always less than synchronous speed, while the torque developed and direction of rotation are always the same.

Therefore, the frequency can be controlled readily by an eddy current induction brake regulating the speed of the frequency converter. The simple block schematic diagram, *Fig.* 2, shows the units involved in this application, and *Fig.* 3 shows the power flow as well as the distribution in the various units concerned.

Functional Operation of the Drive

The functions of the various units in the system can best be illustrated by describing the starting of the drive and bringing it to a predetermined speed.

The induction frequency converter is, for all practical purposes, a wound-rotor induction motor. In starting the induction frequency converter, a resistor in series with the dynamometer motor is first connected across the slip rings. The line switch to the stator is closed, as with any wound-rotor motor. The converter then accelerates to near synchronous speed, and the rotor of the de-energized eddy current brake is accelerated with it.

At this speed, the voltage and frequency across the slip rings of the induction frequency converter are nearly equal to zero. The squirrel-cage motor terminals are then connected directly to the slip rings by bypassing the resistor. Since the voltage and frequency are not sufficient to turn over the dynamometer motor, a static condition on the motor results.

If at this time the eddy current brake is energized, it will develop a braking torque that will decrease the speed of the frequency converter. As speed decreases, the frequency and the voltage across the slip rings increase. At a low frequency there is sufficient voltage across the rings of the converter and the dynamometer stator to start the dynamometer motor.

After it is started, speed of the dynamometer motor is easily and accurately controlled by adjusting the excitation of the eddy current brake. This controls the speed and output frequency of the converter, and conversely the speed of the dynamometer motor.

It is not feasible to adjust the brake excitation

manually in practice. To maintain constant speed, a change in torque demand on the dynamometer motor must be matched almost instantly by an adjustment in brake excitation. To accomplish this, a governor-generator driven by the dynamometer motor provides a signal to an electronic control. The electronic control automatically adjusts brake excitation in response to the governor-generator signal. With this equipment, speed is accurately and quickly controlled.

Design Details

Dynamometer: One of the prime requirements of this equipment is accurate measurement of motoring torque. Care was taken to minimize losses that would impair sensitivity or accuracy. The dynamometer motor, *Fig.* 4, is cradled in hydrostatic lift trunnion bearings. These bearings support the entire motor unit on two trunnions built integrally with the motor end housings. High pressure oil jacking floats the motor on a film of oil and practically avoids any frictional resistance to the rotation of the stator within the limited arc of travel necessary to actuate the torque measuring equipment.

Torque reaction between the motor rotor and stator is transferred from the stator through a torque arm mounted on the side of the stator to a pneumatic balancing device. The balancing device measures in air pressure the pounds of force necessary at the end of the torque arm to balance the torque reaction in the stator.

To minimize parasitic frictional drag, all connections to the motor are made on the vertical centerline. The extra long motor leads are brought out from the top of the motor and are made of flexible cable. Ventilating air is carried through the base of the motor by a duct. There is a narrow circumferential clearance between the duct and the stator to prevent any drag from that source.

Forced ventilation with a suction blower is necessary because the constant torque output requirement results in full motor losses at low speeds. Oil lines to the rotor bearings have flexible connections and the oil outlets have telescopic fittings to further minimize drag. Care is also exercised to design the rotor and stator for minimum windage torque.

Frequency Converter: The induction frequency converter is essentially a wound-rotor motor with special charactersitics and operates as a rotating transformer. Since rotor frequency varies directly in proportion to slip speed (the difference between synchronous speed and rotor speed), control of rotor output frequency is accomplished by controlling the rotor speed. The open circuit rotor voltage produced is also directly proportional to the frequency.

Because of this, when the dynamometer motor is connected to the rotor, a constant ratio of voltage per cycle is obtained if regulation caused by load changes is neglected. This inherent feature of the induction frequency converter is ideal for the service required, since in operation on variable frequency, constant volts per cycle are required by the dynamometer motor on a constant-torque load curve.

Forced ventilation is required at the lower speeds of operation because the converter operates with

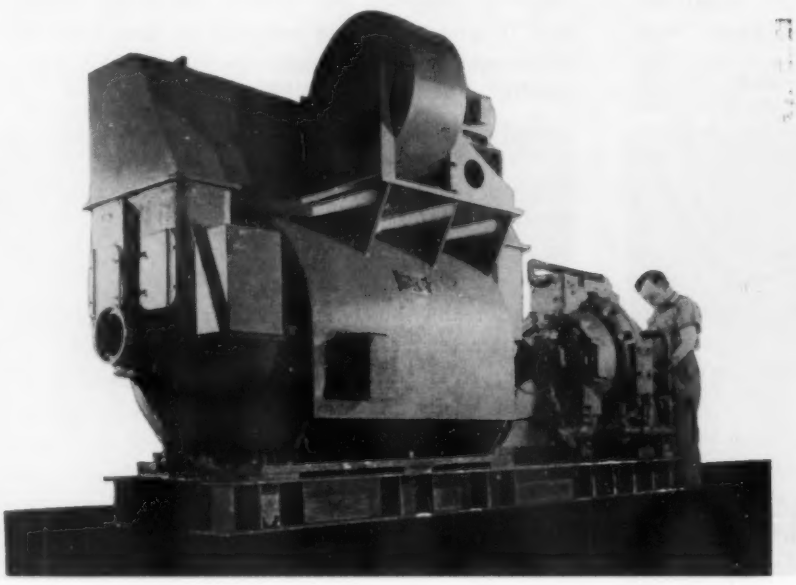


Fig. 5. Unit at the left is the 1250-hp, 4800 rpm wound rotor induction frequency converter with its top-mounted blower. At right is the inductor type eddy current brake.

For example, when it is necessary to operate at

constant torque capacity over a speed range of 180 to 1620 rpm. Ventilating air is taken from the room by a top-mounted motor-driven blower that forces it through the converter and discharges it back into the room. *Fig.* 5 shows the combination converter-brake set.

Eddy Current Brake: Heart of the speed control system is a simple inductor type eddy current brake. It is water-cooled because under certain operating conditions it must absorb as much as 1000 hp. To carry away the heat generated by that amount of power requires a flow of nearly 75 gpm of 90 F cooling water.

The brake consists of a stator that acts as the magnet frame and incorporates a single toroidal coil for excitation. The rotor is toothed, similar to a spur gear. As the rotor turns in the stator, the rotor teeth set up a pulsating flux in the cylindrical stator pole faces. The flux pulsations generate an eddy current that reacts with the magnetized rotor teeth to develop torque. The amount of torque developed is dependent on both excitation and speed, and varies as shown in *Fig.* 6.

Cooling water is injected into the air gap of the brake to contact the surfaces in which the eddy currents are developed. Consequently, the area in which the brake heat is generated is scoured with coolant and effective absorption of the brake heat is achieved. Automatic temperature controls regulate the flow of cooling water for the brake.

The brake magnets are energized by a single coil that requires only 2 kw for maximum excitation. Since the excitation power is low, it is easily supplied by a small electronic speed regulating control. In service, the speed control holds the speed within ¼ of 1 percent of top speed over a range from 2 to 57 cps, which exceeds requirements by a considerable margin. Speed is set by adjusting a small potentiometer in the grid circuit of the control. A 1000-hp motor is thus controlled by just a few watts.

The signal from the governor-generator on the dynamometer motor is balanced against reference voltage and the resultant is fed to the eddy current brake. *Fig* 7 shows the units of the control circuit.

Successful Operation

Data obtained from combined tests prove that the drive and its components more than meet all requirements. Full-load torque is available above and below as well as throughout the specified speed range. At full rated torque, the minimum rated operating speed of 350 rpm is obtained at a frequency of approximately 6 cps and full rated torque is developed at a frequency several cycles less than this. On test, the drive operated successfully on reduced torque at frequencies as low as 2 cps. Although top rated speed is 3180 rpm, full rated torque is still available at 3220 rpm, achieved at a frequency of 54 cycles per second.

Speed control accuracy and ease of adjustment also meet the requirements set up for the drive. Tests have demonstrated that designs of the dynamometer drive motor and the induction frequency converter are such that at all operating frequencies stability of the alternating-current loop, breakdown torque of the dynamometer drive motor and slip of the dynamometer drive motor are better than required to give a successful drive.

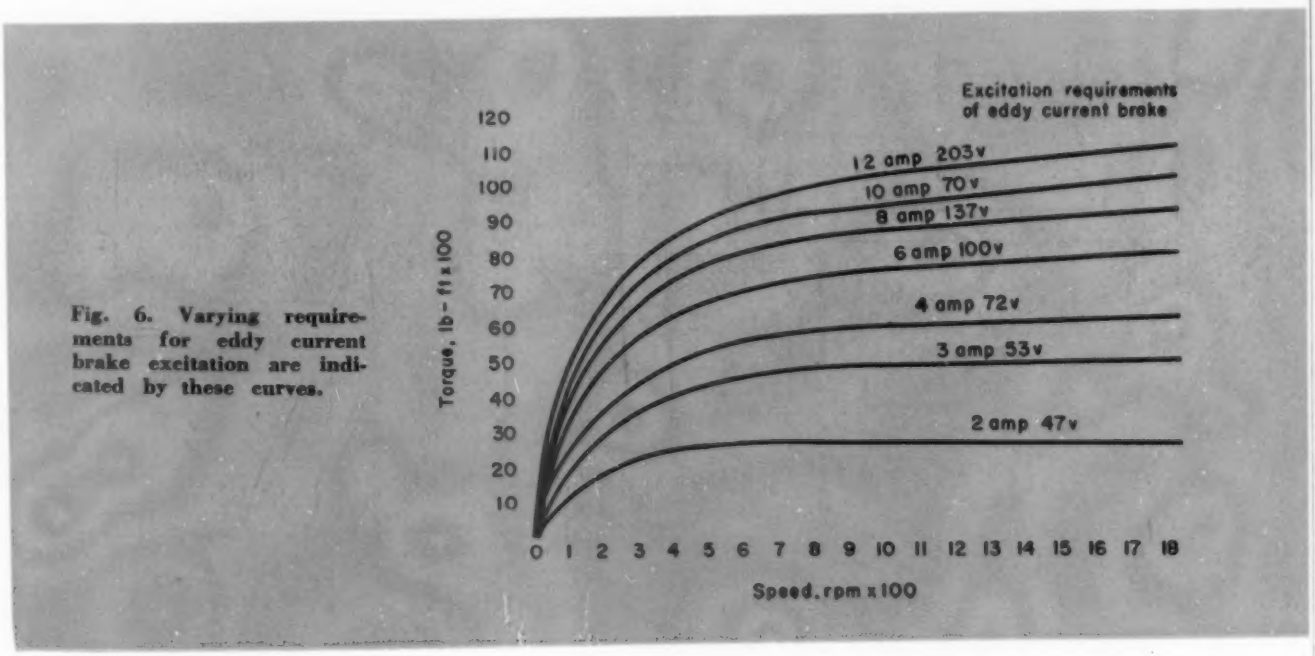


Fig. 6. Varying requirements for eddy current brake excitation are indicated by these curves.

Modifications Broaden Use

The successful application of this dynamometer opens up an entirely new field, not only for large high-speed dynamometers, but also for solidly mounted adjustable speed drives. The use of a simple squirrel-cage motor results in a compact drive unit that requires a minimum of floor space at the driven machine—where space is usually an important consideration.

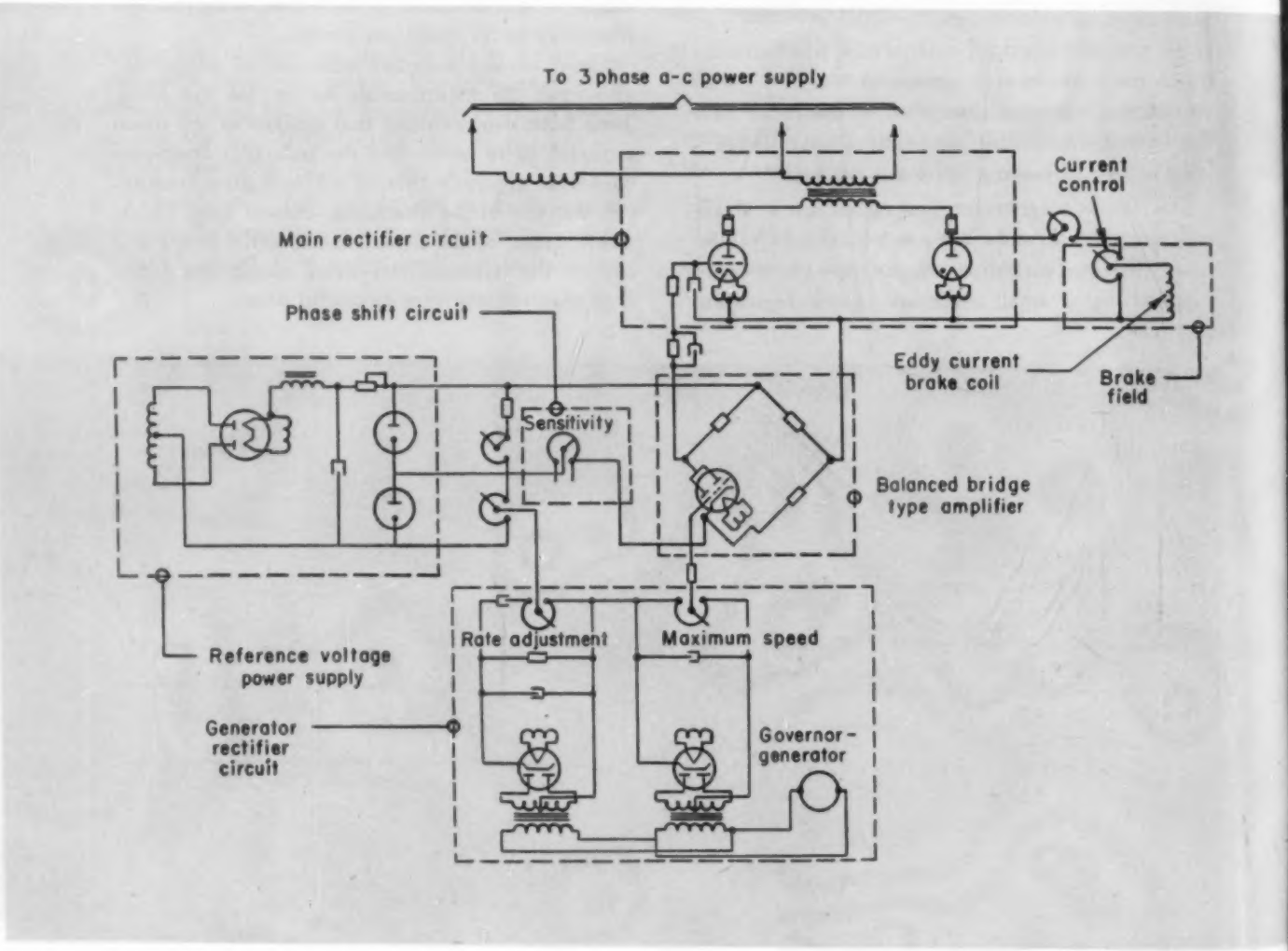
The squirrel-cage motor lends itself to high-speed operation as no other electrical motor does. Within mechanical limits, it can be used direct-connected on many applications formerly requiring gears. Furthermore, the squirrel-cage motor is relatively rugged, simple in its construction and requires minimum maintenance. Speed control for such a drive is also simple and adjustments are easily made by changing settings of small resistors.

Modifications of the basic machinery arrangement used in this drive for a motoring dynamometer can be made to meet special requirements of other applications.

For example, when it is necessary to operate at frequencies above 60 cps, the eddy current brake can be replaced by an eddy current coupling. When driven by either an induction or synchronous motor, an arrangement such as this can be economical to frequencies of 90 cps or more if the load speed torque curve permits. If operation both above and below cps is required, a two-speed motor can be used to drive the eddy current coupling.

Speed ranges and speed-torque requirements that cannot be economically accommodated by an induction frequency converter can often be met by another modification. The induction frequency converter can be replaced by a synchronous generator that is driven through an eddy current magnetic coupling by either an induction or synchronous motor.

With higher speed testing, such as required for aircraft components, becoming a greater problem daily, the variable frequency drive that is adaptable to dynamometer operation promises to become more prominent and will probably find much wider use in the near future.



Finish Rolling improves cast iron ways

Fig. 1. Typical tool for cold rolling of cast iron machine tool ways to improve surface quality.

By Wackch Iwascheff

Consulting Engineer

Braunschweig, Germany

Professor Wackch Iwascheff, now a consulting engineer for machine tool design and production was formerly the technical manager of Reichswerke Stahlwerk Braunschweig. He was chairman of the department of machine tools and factory organization at the Technical University in Moscow until 1925. After that he was active in Western Europe as a consulting engineer and lecturer, and authored numerous technical articles published in several countries.

PRODUCTION OF FINISHED SURFACES on cast iron machine tool ways by rolling offers several practical advantages over former methods. This procedure applies especially to parts that have been planed or milled, and which ordinarily would require finish grinding or scraping to achieve the desired working surface. Rolling a machined face with steel cylinders under pressure, using an attachment such as shown in *Fig.* 1, results in a smooth, hard and wear-resistant surface ideally suited for tool ways. The process can be accomplished more quickly than either grinding or scraping and results in a finish better suited to machine tool way requirements.

A rolled finish can be produced on a clean surface right after the planing or usual semifinish machining operation. The resulting compressed surface layer, which is approximately 0.004-inch thick, has few graphite spots. It can be assumed that the ferrite as well as the graphite is compressed in the surface layer thus forming a close-grained, integrated structure. Because of cold working the top layer shows an increase in hardness that effectively

Table 1—Wear and Horizontal Force After Use

Surface Finish	12,400 Operations		17,250 Operations		36,000 Operations	
	Wear in	Force lb	Wear in	Force lb	Wear in	Force lb
Bed Scraped	0.00005	640	0.00006	1470	0.00009	905
Slider Scraped	0.00008		0.00007		0.00008	
Bed Finish-Rolled	0.00004	565	0.00004	1300	0.00006	828
Slider Scraped	0.00008		0.00008		0.00009	

protects the layers beneath and the resulting increase in wear resistance is valuable in maintaining machine tool operating accuracy. Similar improvements in surface finish can be obtained by more time-consuming scraping. However, the amount of cold working produced by scraping and the surface hardening resulting are not to the same magnitude as that achieved by finish rolling. The advantage of scraping is the smooth, flat surface.

Feasibility of this process has been established by various tests in laboratories of the Technical Universities in Aachen and Hannover, as well as in industry. Results of comparative wear tests at Aachen are summarized in TABLE 1. They show that where a scraped bed and a scraped slider are used together the wear and the horizontal force required to move the slider are greater than if a scraped slider is used with a finish-rolled bed. Data are compared after three periods of operation of the sliders over the two types of ways.

It has been found possible to obtain increased surface hardness without selecting particular compositions of cast iron. The Brinell hardness of the surface can be increased from 131 to 154 Bhn. by finish rolling.

Tests conducted by manufacturers on finish-rolled bearing surfaces can be summarized as follows:

A rolled surface 10 feet long showed no noticeable deviations and only with careful scraping was it possible to obtain similar surface quality. When tested for roughness by using the finger tip, the surface felt smooth. With the aid of an accurate three-foot straightedge, to which Prussian blue had been applied, indications were that 60 to 65 percent of the surface area was in the same plane. The lower spots were recessed no more than 0.00004 inch. In some test runs, the surface retained the same characteristics after 72,000 operating strokes of the machine as it had at the start.

A typical composite photomicrograph, *Fig.* 2, shows a rolled and compressed cast iron surface and the material beneath it. The larger size of graphite flakes can be seen in the unworked base metal. Surface finish as measured with a Schmaltz surface finish microscope, after planing but prior to rolling, is pictured in *Fig.* 3. To properly interpret this picture of surface finish, it must be realized that vertical magnification is 40 times greater than horizontal. Representation of surface finishes in this manner are somewhat similar to those obtained by the method of taper sectioning.

Surface finish after the same material has been finish rolled is shown in *Fig.* 4. The distance represented by the spacing between horizontal lines is 0.00008 inch and it can be seen that the peak to valley variations in the surface have been greatly reduced. Both photomicrographs were taken perpendicular to the direction of tool travel, but a similar improvement was seen in photomicrographs taken parellel to the direction of tool travel.

It has been established that finish rolling of cast iron ways is an economical process for obtaining a smooth and flat bearing surface. Savings in production time, compared with scraping, increase with the length of the surface to be finished, since rolling time is not directly proportional to surface length.

Useful life of ways is increased, coefficient of friction is decreased and the rate of wear is reduced for rolled surfaces when compared with scraped surfaces. A new roll-finished surface has greater oil-holding capacity than a surface that has been finish ground and the rolled surface gives a performance similar to a well-scraped finish that has had a running-in period of several months.

An attachment, *Fig.* 1, for roll finishing a work-

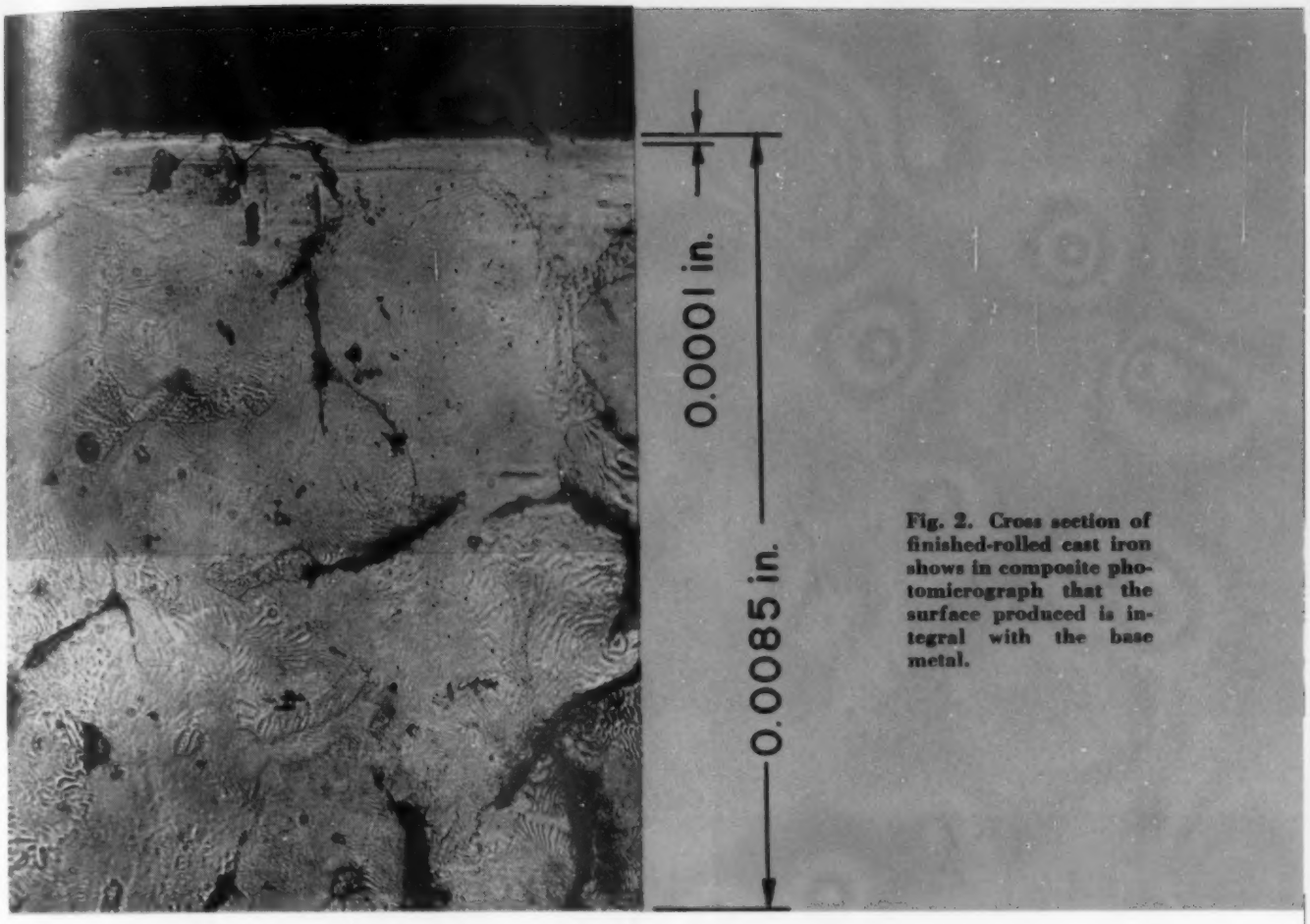


Fig. 2. Cross section of finished-rolled cast iron shows in composite photomicrograph that the surface produced is integral with the base metal.

piece can be provided on a planer or other machine tool and the operation can be performed following the planing or other machining without disturbing the setup. Flat, V, or inverted-V ways can be rolled, but dovetails cannot. The process is one that should find increasing application in the manufacture of machine tools.

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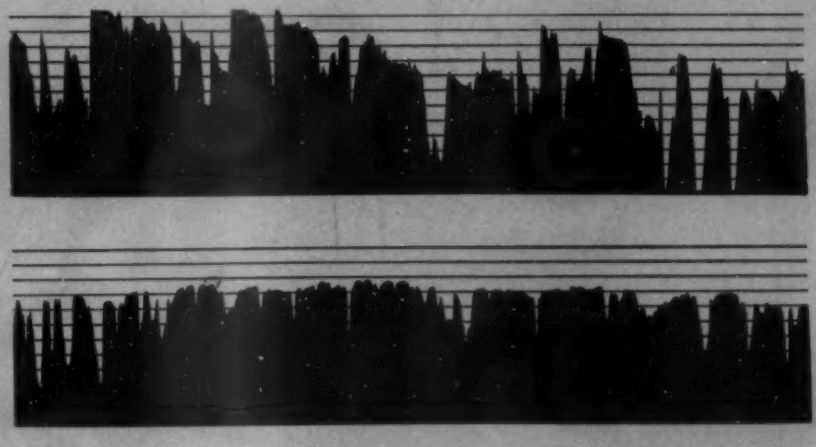
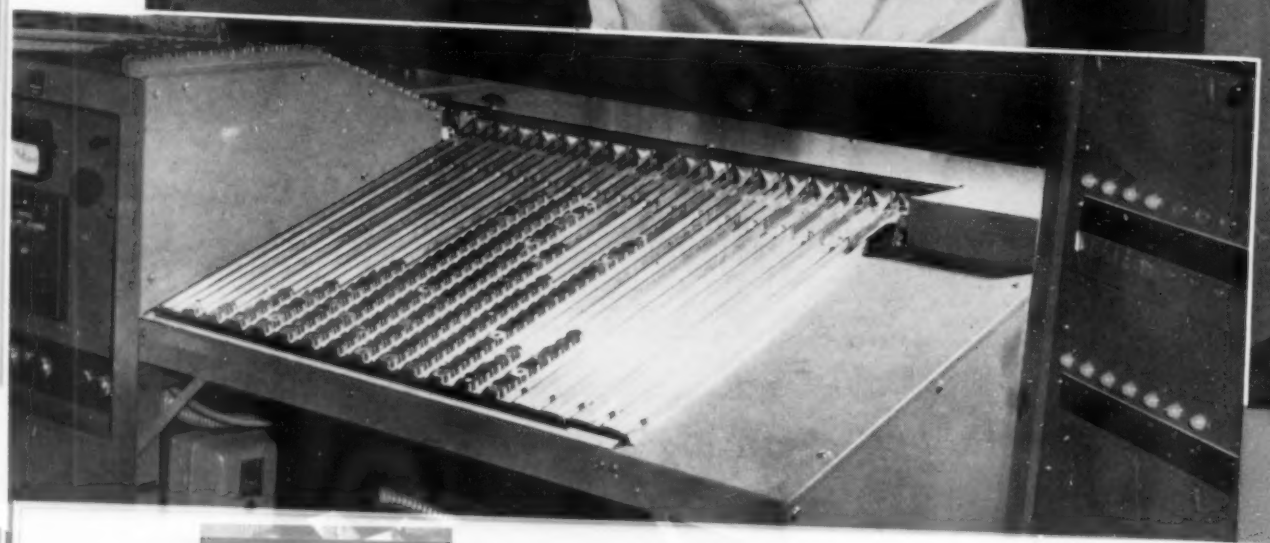
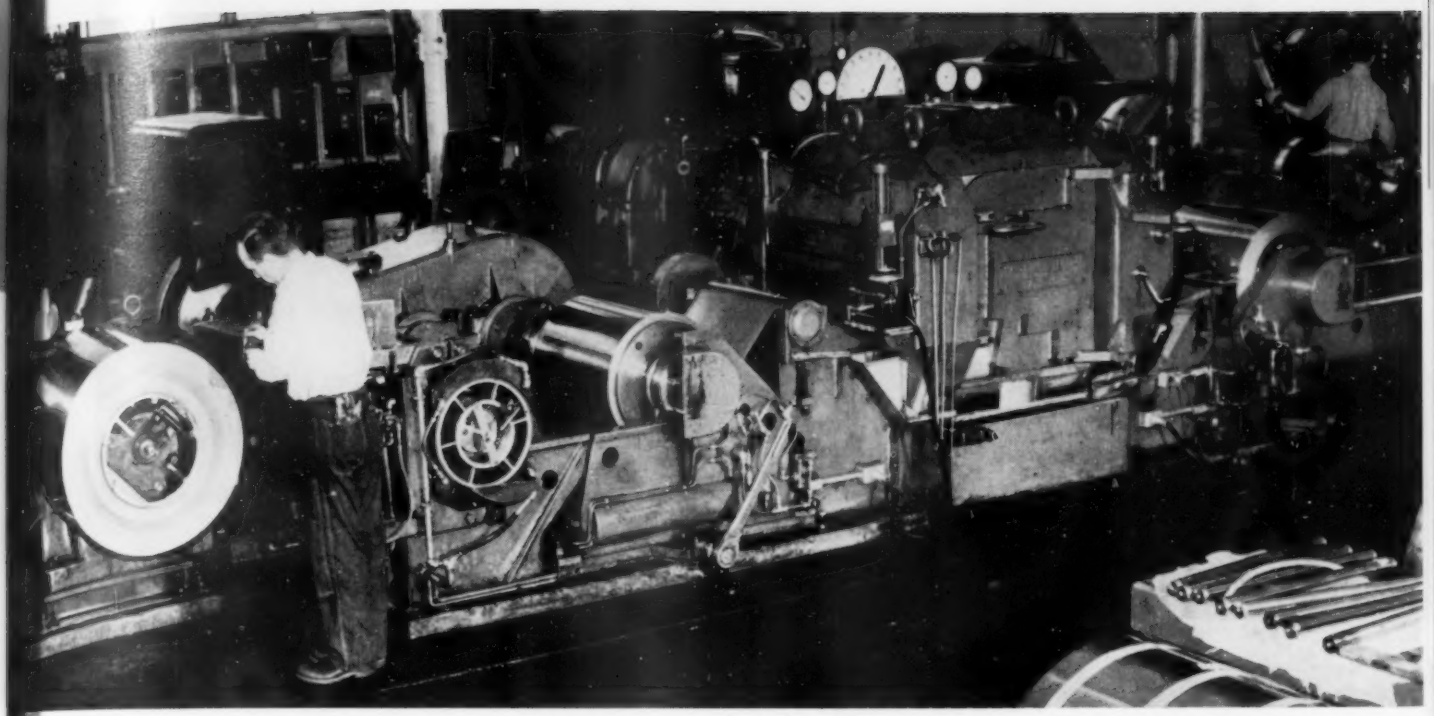


Fig. 3. Surface finish profile photomicrograph after planing but before finish rolling. Magnification: vertical, 1000X; horizontal, 25X.

Fig. 4. Photomicrograph of surface profile shown in *Fig.* 3 after it has been finish-rolled. Magnification: vertical, 1000X; horizontal, 25X.

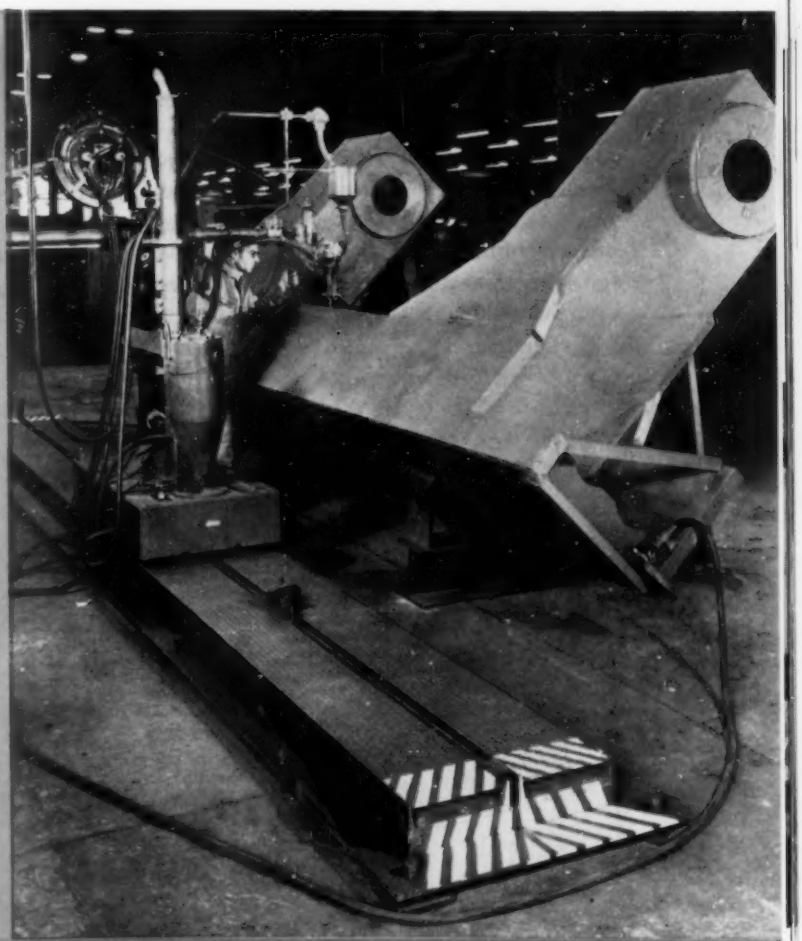
TOOLS at work





COLD REDUCING CARBON STEEL as thin as 0.001 inch, new 25-inch Sendzimir mill maintains accuracy within 3 percent across widths. In operation at Rodney Metals, New Bedford, Mass., the mill also cold reduces stainless to 0.002 in., aluminum alloys to gauges as thin as 0.006 inch.

SPECIALLY DEVELOPED automatic submerged-melt welder at work on frame of a stretch press at National Supply Co., Torrance, Calif. has quadrupled production and improved quality over previous manual operation. The hinged head adjusts vertically, and laterally with the carriage and to angular positions on the end of the arm.



AIR-ELECTRONIC GAGE checks cylinders for refrigerator unit at Westinghouse Springfield, Mass. plant to 0.0001 inch for segregation in one of 16 size categories. The operator then deposits it in the chute under her hand and it slides to the left where it is automatically stamped with a code number. Automatic piston gage (inset) sorts mating pistons into disposal chutes for selective assembly with proper size cylinders.

Photo, Courtesy Federal Products Corp.

Magnesium Forming

Part 2 — Hot Drop Hammer Forming and Sheet Stretching

By Francis L. Coenen*

General Supervisor, Tool Research Group
Pilotless Aircraft Div.
Boeing Airplane Co.
Seattle, Wash.

As MAGNESIUM ALLOYS have been used in more applications and in larger production quantites, the exact nature of the materials had to be determined. In general, magnesium alloys can be worked like no other single metal, although various characteristics have equivalents in other materials. Magnesium may act like aluminum in one forming process, the same alloy may have totally different properties in another process. For this reason, experimental and production data have been collated to determine just how magnesium alloys react and the properties that apply when magnesium alloys are hot formed in the drop hammer and hot formed by stretch forming.

*Senior member ASTE Seattle chapter

Hot Forming in the Drop Hammer

Although drop hammers, such as that shown in *Fig.* 1, are not ideally suited to hot forming in general or to working magnesium in particular, excellent results are achieved within certain limits. When magnesium sheet is hot formed at its upper temperature limit (550 F ± 25 deg), its formability at least equals that of 3S-0 aluminum sheet. Fewer compression wrinkles will result in magnesium than in 24S-0 on the same dies. Temperature variations and extreme speeds of operation make severe drawing in the drop hammer difficult and this is the only type of forming not recommended for the drop hammer.

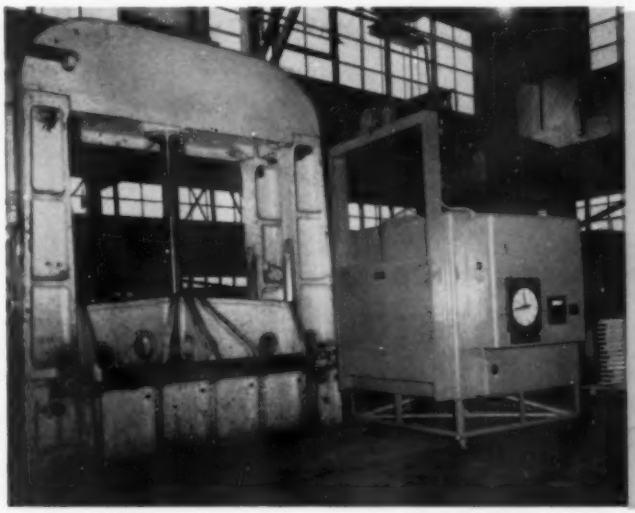


Fig. 1. Circulating hot air ovens are positioned near individual drop hammers to minimize temperature loss during the time between removal of the part from the oven and the hammer strike. The hammer is operated with a free fall.

Table 1—Linear Coefficients of Expansion for Die Materials

unpleasant odors, are easily applied with a brush at

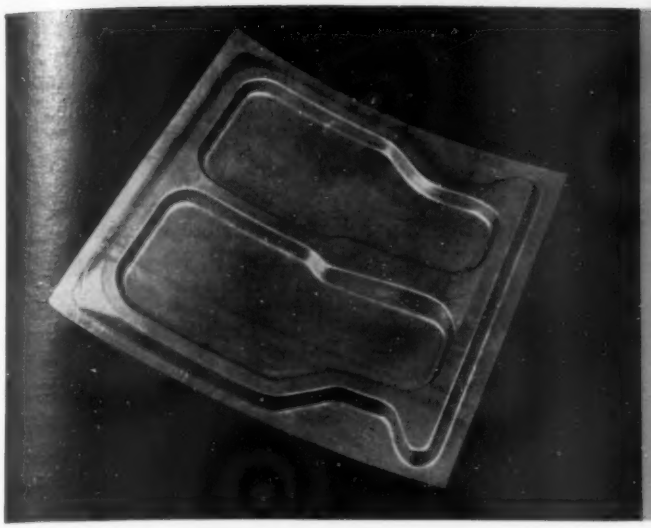


Fig. 2. Representative of magnesium parts than can be made in the drop hammer is this inner door skin for an airplane.

Drop hammers are principally used to achieve shallow draws, *Fig.* 2, stampings, asymmetrical shapes and special springback control, all in the 550-F temperature range. Drop hammer forming of hard-rolled sheet at 325 F is not recommended and is limited to simple shapes having a maximum compression of five percent or pure stretch of ten percent. The formability of hard-rolled magnesium sheet in the drop hammer at 325 F is only slightly better than that of 75S-T6 at room temperature.

Magnesium is successfully formed on drop hammer dies within the limits allowed by the following considerations.

SPRINGBACK: Springback of magnesium decreases as the forming temperature is increased toward the allowable limit. To some extent, springback is also a function of total strain work (amount of hammering). At drop hammer temperatures, springback is at a minimum and hammer forming is to be preferred when springback control is otherwise difficult or impossible.

RATE-OF-LOADING: Rate-of-loading can be controlled to some extent by the drop hammer operator but should not be expected to be held within close limits. Severe forms may be initiated by allowing the punch to descend slowly into the die, after which succeeding strikes set the material for size or compress wrinkles. Impact loading as exemplified by the drop hammer, is the practicable upper limit of loading speed for magnesium.

FORMING TEMPERATURE: Best temperature for drop hammer forming is the maximum temperature allowed for the condition of the alloy or the maximum temperature obtainable at time of forming. High creep rate prevents heating Kirksite dies above 500 F. Lead punches are limited to a maximum of 250 F for the same reason; hence, for a given maximum theoretical temperature, there is a practical maximum forming temperature that is always somewhat less than the oven temperature of the part.

ALLOWABLE TIME: Because several strikes may have to be made with a reheat step between each, the allowable time is important. A heating time of five minutes per stage should be allowed for material 0.051 in. thick, and nine minutes per stage for material 0.125 in. thick. Using graphs and methods outlined in Part 1 of this article, allowable time can be computed easily.

CONVENIENCE AND SAFETY: The temperatures of the hammer bed and die for forming annealed magnesium are at the permissible maximum for Kirksite of 500 F. The difficulties of handling large parts at this temperature will cause variations in part temperature during forming, as well as a disagreeable situation for the operator. In general, very large parts should be investigated to see if stretch forming with its lower temperatures can be used.

PRACTICABLE STAGING: Based on a drawn cup with no rim flanges when finished, a measure of drawability is given by:

$$\text{Percent Reduction} = \frac{D - d}{D}$$

where

D = blank diameter, in.

d = punch diameter, in.

When magnesium sheet is drawn in stages, small percentage reductions may be readily hammer formed. The tensile strengths required are a direct function of the volume in compression, which is small in such cases. When drawing or hammer forming at 450 F, the tensile limit requires that the reduction limit be somewhere near ten percent. To accomplish this without wrinkling requires the use of rubber staging. Rubber bears only a slight resemblance to the pressure ring of a draw die but is effective because of the relatively high speed at which the hammer head descends. However, reductions of more than ten percent should be reserved

Table 1—Linear Coefficients of Expansion for Die Materials

Material	Temperature Range (deg F)	Coefficient (per deg F)
Magnesium Alloy	68 to 212, mean	0.0000145
Magnesium Alloy	68 to 752	0.000016
Aluminum Alloy	68 to 750	0.00001234
Kirksite A	68 to 750	0.0000154
Mild Steel	68 to 750	0.00000636
Meehanite	100 to 1000	0.00000684
14% Antimonial Lead	68 to 212, mean	0.0000115

for the hydraulic deep draw press.

The number of stages for any given hammer die is not a function of easily selected variables. As a rule, determination of the number of stages follows computation of the percent draw reduction. Types of shapes to be formed, such as reverses in contour, will also effect this.

A simple rule, based on the number of stages used on successfully formed parts, can be followed in estimating the number of stages. For maximum draw on lighter gages, such as 0.040 in., ten stages may be necessary. Since heating time per stage is nearly five minutes, this is also the maximum possible number of stages, if one minute is allowed for handling the part hot. Because of the longer heating times required, the upper limit for heavy gage parts is six stages.

LUBRICATION: It has been common practice to spray on colloidal graphite suspended in a volatile carrier as a lubricant when hot forming magnesium sheet. A die lubricant of 20-percent graphite in tallow was used but it had to be applied by hand with cloths. Use of graphite introduces cleaning problems after hot forming operations and efforts have been made to find a satisfactory substitute.

Vegetable-lecithin fat base compounds—heavy viscous fluids—that were developed as parting agents for releasing low pressure laminates from molds have been tried and seem to have several advantages over graphite. They are easy to remove from hot formed parts, even when a burned-on residue is left on the parts for over 24 hours. In addition, these compounds have good lubricity at temperatures up to 500 F, are nontoxic, do not have unpleasant odors, are easily applied with a brush at about 180 F and have satisfactory film strength. They have no apparent chemical reaction with magnesium. Dies are easily cleaned by cloths or fine steel wool.

Fabrication Procedure: Blanks should be cleaned in a vapor degreaser or other cleaner before being placed in the oven. This prevents accumulations of soil on the blanks from being transferred to the die surfaces, where it would tend to score parts or otherwise retard free forming action.

PREHEATING: Preheating the blanks in an oven to the proper, uniform temperature is the next step. For annealed sheet, QQ-M-44-0, the temperature range of 550 to 575 F provides the required formability at drop hammer speeds. The allowable maximum temperature is 575 F, which can be maintained for a period not exceeding one hour. For hard rolled sheet, QQ-M-44-H, the permissible range of maximum formability is 275 to 340 F, which can be held for a period not exceeding 15 minutes. Parts that have exceeded the maximum time at temperature should not be scrapped without inspection. They may be acceptable.

Both flat blanks and partially formed parts are heated by placing them on a wire mesh shelf in a circulating hot air oven. The oven should be thermostatically controlled within close limits. Heating time from room temperature is between four and

Fig. 3. Compound forms can be made of magnesium if properly designed and heated. This part was formed in a drop hammer from a sheet of QQ-M-44-H.

five minutes for both annealed and hard rolled sheet.

The heating oven should be as close as possible to the drop hammer because parts lose heat at the rate of 45 deg in 5 sec. Most ovens are mobile to a degree so they can be so positioned. The chief reason for externally preheating magnesium blanks is to avoid delays that would be caused by heating in the dies and to insure uniform temperatures throughout the blank.

FORMING: The actual forming of parts is carried out in the same manner as for any cold forming material. When the electric platen is set at 500 F and the parts are preheated to 575 F, the actual forming temperature is in the vicinity of 500 F. An effort should be made to maintain the forming temperature as high as possible because part size and shape may be affected otherwise.

Immediately after formation in a drop hammer, magnesium parts should be cleaned. This will prevent any corrosive action that might result from the lubricant.

Die Design: Optimum design of dies for hammer forming magnesium alloy sheet would enable production of parts with a single impact without staging. Since this is seldom possible, a more practical aim is to obtain dies that will withstand expected temperatures and produce parts that will contract to design size at room temperature. In addition, attention must be paid to the need for restraining beads and trapping surfaces.

The die should be designed so that needed metal will be brought to overstressed areas. Generous radii must be used to permit metal flow without restriction and to maintain good forming action without stretching. Since hot forming magnesium alloy sheet of the thicknesses usually used does not require heavy impacts, the lower die cavities should be as near the heat source as possible.

CONFIGURATION: Because forming dies are used at high temperatures there is danger of damage from creep or impact flattening. The concave configuration of dies, whether of Kirksite or Meehanite, tends to maintain a reasonable fit between the punch and die. If this configuration is combined with shallow restraining beads, or additional part cavities in the case of small parts, it is generally an acceptable shape. Dies should have a plane upper surface perpendicular to the line of action unless the shape of the part absolutely precludes this.

The radius of all drawing edges should be about eight metal thicknesses, with punch minimum radii greater than eight thicknesses if not already so required by the design of the part.

SIZE: Dies that are made of aluminum, magnesium or Kirksite and that are used to form magnesium while at the same temperature as the blank do not require a correction for expansion. Dies that form hot parts while they themselves are at some lower temperature may conceivably require considerable correction.

The general expression to determine die design dimensions is:

$$L_d = \frac{L_p\left[1 + (t_p - t_r)k_p\right]}{1 + (t_d - t_r)k_d}$$

where:

L_d = die design dimension, in.

L_p = engineering part dimension, in.

t_p = part temperature at forming, deg F

t_r = room temperature, deg F

t_d = die temperature at forming, deg F

k_p = linear expansion coefficient, part

k_d = linear expansion coefficient, die

Coefficients of expansion for various die materials are shown in TABLE 1. Using these figures and the general equation, it can be shown that die dimensions can be in error by as much as 0.005 in. per inch if a 200-deg temperature differential exists between die and part. However, the temperature difference that introduces errors in most instances can sometimes be used to control springback. This is especially true of cylindrical forms, such as *Fig.* 3.

Poor occlusion of the punch and die may be anticipated because original fitting is done at room temperature, and because of differences of operating temperatures of the punch and die. The high creep rate of the lead may make some refitting necessary but any further temperature changes will nullify the benefits so obtained. Current practice of heating the punch by radiation from the die offers no hope for relief from this defect but satisfactory results within production limits are obtained.

DIE MATERIALS: Zinc base die alloys are considered unreliable for long production runs at high temperatures. For runs of 50 parts or less, Kirksite has adequate stability. Meehanite castings should be used for larger runs. Particularly where standard convex configurations are used, lead seems to be the most practical and economical punch material, both for experimental and production work.

Hot Stretch Forming

The total stretch that can be achieved with magnesium alloys compares favorably with that for 24S-0. However, its weakness in shear makes it much more difficult to handle on a two-ram stretch press. No other commonly stretch formed material has the tendency to wrinkle that magnesium has.

Magnesium is stretch formed readily in either the

annealed or hard-rolled condition and the same techniques are used for both materials. Best performance is obtained by heating the sheet to 270-340 F and stretching it slowly. Difficult shapes are sometimes accomplished by "inching."

Measures of Formability: Not all parts can be produced by stretch forming. One measure of the formability is the contour required by the finished part. A stretch form part must have continuous positive contour (convex surface) in at least one orientation. Parts can be classified by contour as follows:

1. Universal positive symmetrical (sphere or ellipsoid)
2. Biaxial positive symmetrical (side of a football)
3. Biaxial positive asymmetrical (usual aircraft skin)
4. Uniaxial positive (straight leading edge skin)
5. Uniaxial positive-uniaxial negative (saddleback)
6. Combinations of these (curved S-sections)

Curvature is usually expressed by an equivalent or approximate circle, and hence by some radius of curvature.

Stretch forming dies are grouped by whether they produce edge restraint or not. Angular edges parallel to the sheet motion serve as restraint to prevent lateral motion.

The best measure of formability is the percentage difference in stretch that can be obtained. Since the shortest length is deemed not to stretch, the percentage stretch is given as:

$$P = \frac{L - S}{S}$$

where:

P = differential stretch

L = longest stretched length in part

S = shortest comparable length parallel to longest stretched length

It is assumed that L and S are of equal length before stretching. Any measure of stretch formability of a part must take into account contour, differential stretch and associated considerations derived from them.

SPRINGBACK: Springback is at a minimum on parts that are hot stretch formed. When parts lose their contour after forming, it is an indication that they were not stretched locally into the plastic uniform elongation range. Springback and contour control are good for positive contours having radii of curvature of 20 ft or less. One percent total stretch is usually added for springback control.

WRINKLING: Wrinkling is probably the greatest problem in stretch forming magnesium. Low curvature, severely asymmetrical blocks provide the greatest challenge, especially when restraints are difficult to apply. One explanation for this is that properties perpendicular to the direction of stretching are lowered after forming. The compressive stress induced by the tension of stretching is probably sufficient to cause some surface fibers to yield. Since such yielding may be asymmetrical, wrinkles are generated.

The respective anisotropies (directional formability differences) of aluminum and steel remain constant so that wrinkles can be removed by further stretching. Not so for magnesium, which exhibits

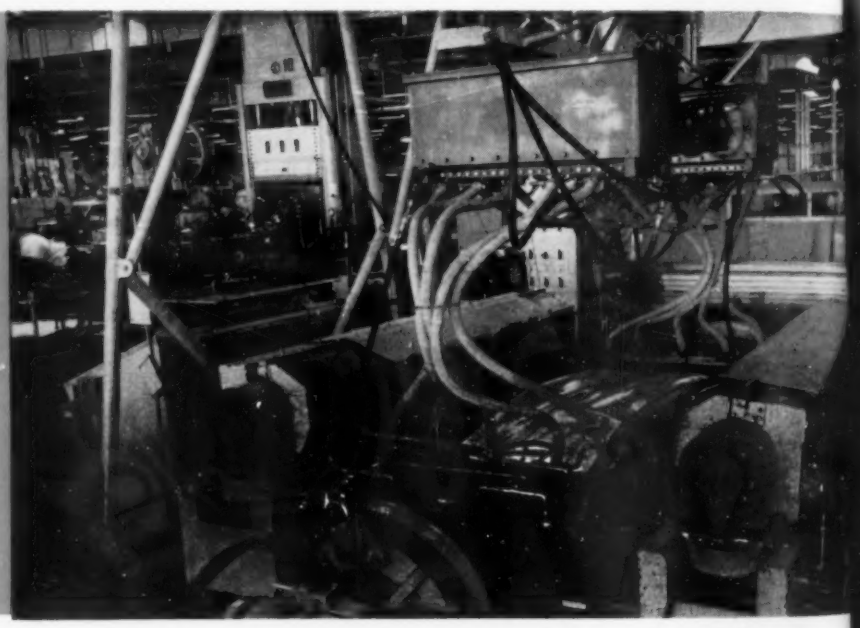


Fig. 4. Stretch forming magnesium skins using resistance heating. To prevent galling, a glass fiber cloth is placed between the block and the sheet.

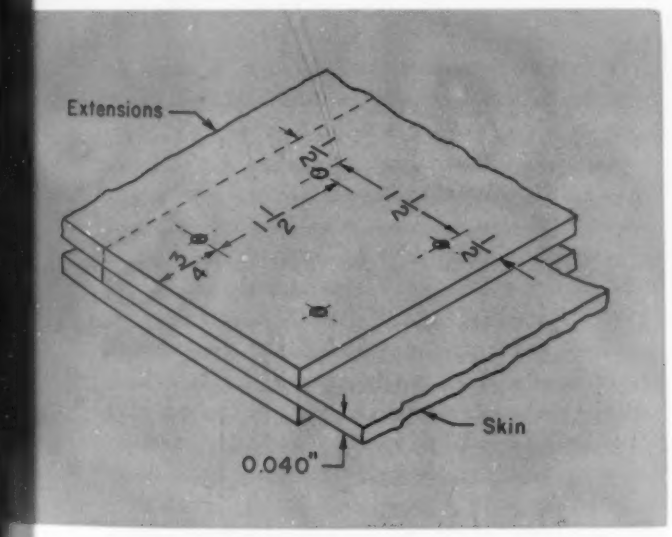
the reverse property. Control of wrinkling in magnesium must be by prevention. This is best accomplished by building restraints into the dies themselves.

Some parts have been formed with a differential stretch of 20 percent. No wrinkling occurred when sheets were stretched parallel to the axis of near symmetry. When stretching was attempted perpendicular to the axis, a condition of severe asymmetry, severe wrinkles formed at four percent stretch. The only prevention for such unexplained results is the inclusion of restraints in the dies.

An example of such restraint is shown at the left of *Fig.* 4. The part is wrapped over the left edge and prevents movement toward the right. The positive curvature at the right of the part is insufficient to act as a restraint because its radius is too large. To offer maximum resistance to wrinkling, a restraint should be added beyond the right side, the same size as the one at the left and parallel to the main hump. This would result in a double saddleback shape.

DIE FRICTION: Die friction can be useful in preventing longitudinal wrinkles, but generally just complicates the problem of force resolution. Sources

Fig. 5. Spot weld pattern for extending stretch press blanks insures simultaneous loading of the welds. Such extensions increase the size of the part that can be produced.



of friction also are the principal causes of scratches. Belt friction formulas indicate that generated forces are functions of angles of contact and friction coefficients. Applied to a stretch form block, this means that sufficient angle on side restraints must be allowed for maximum friction. If less restraint is required, adjustment can be made simply by narrowing the blank to allow less angle of contact.

Magnesium can seriously gall when pulled warm over almost any surface. Graphite lubricants reduce this problem but introduce cleaning problems. Use of a glass fiber cloth between the die and the sheet prevents galling. The cloth apparently adheres to and moves with the magnesium. Life of such cloths can be extended by applying mineral oil lubricants to areas where maximum motion of the stretched sheet will occur.

This method works best on Kirksite dies, but is also of value on concrete and plaster blocks. When designing blocks for use with glass fiber cloths, no allowance is required for the thickness of the cloth. The effect of the cloth on the dimensions of finished parts is of no consequence.

SIZE: The direction in which magnesium sheets are rolled has no effect on stretch wrapping parts. Therefore, the only limitation on the size of parts is the size of sheets available. The largest sheets now made are 72 in. wide.

Parts requiring full sheet lengths have been stretched sidewise by spot welding two-thickness extensions to the sheets. The double extensions place the part in double shear and form a grip for the jaws. This method, however, can introduce undesirable stress concentrations at the welds. The spot weld pattern should cause simultaneous loading of all welds if possible. A suitable pattern for 0.040-in. skins, *Fig.* 5, gives reasonably uniform results.

TYPE OF HEATING: Magnesium sheet may be stretch formed by heating either the block or the sheet. The choice of method depends largely on the configuration of the block. When a large area of the sheet immediately touches the block, for which cases sliding friction is an influencing factor, block heating is best. When the initial contacting surface and the friction are small, the sheet should be heated. In the latter case, care need only be taken to prevent the block from chilling the unworked part. Blocks made from low-thermal conductivity materials such as Sil-O-Cel C3 are satisfactory for this purpose.

Electrical resistance heating is used for heating both sheet stock and blocks made of nonmetallic materials. Gas or steam heat, if available, is an economical method of heating Kirksite blocks. If nonmetallic blocks can be used, such as for production of one or two parts, electrical resistance heating is at least equal to other methods.

However, a block designed for a few parts is frequently used again. If it is nonmetallic and has to be stored outside, it will absorb considerable water. A long time will be required to bring such a block to forming temperature. Block materials and methods of heating must be specified in light of future requirements. Where there is any question, Kirksite should probably be used.

RATE AND METHOD OF LOADING: At its forming temperature, magnesium is weak both in shear and tension, and is therefore more subject to forming

efforts that raise stresses locally than are aluminum and steel. Stresses can be raised to dangerous levels by improper operation of the rams on two-ram presses, or by slippage of stretch press jaws.

If a long block is placed on the machine to stretch a blank clamped in the long (side) jaws, the block overhangs the rams. With the block pressing firmly on both ends of the part, if one is moved independent of the other, torque is applied to the part. The effect of the torque will center near the end of the other ram. Any stress raisers, such as nicks in the edge or deep scratches, will tend to start a shear failure.

This does not mean that loading must always occur symmetrically on a stretched blank, but rather that strictly vertical loading, regardless of location, will minimize local stresses through better distribution.

Corrective action for magnesium sheet that proves difficult to stretch usually consists of operating the press at its slowest speed. Sometimes it may be necessary to inch the press. While this action is theoretically of negative value in achieving longer elongation, it has some practical value because it allows the local stresses to distribute their incipient strains by creep action. The result is a more uniformly stretched sheet and hence a longer one.

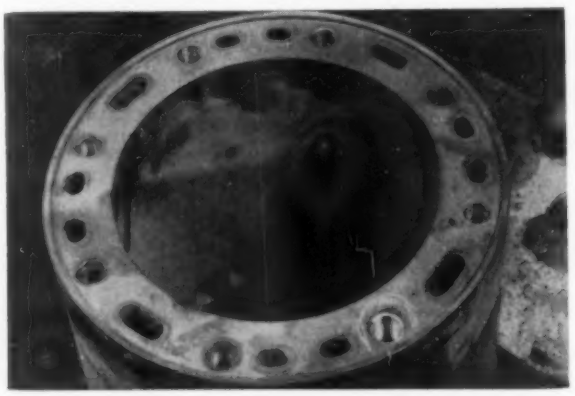
The maximum practical limit for differential stretching over dies of low curvature is about 15 percent. Some local strains may be greater than this during forming and may produce sheet thinning greater than the usual one tenth of thickness allowed. A desirable maximum is about 12 percent, which permits a small amount of over-stretch to forestall springback.

Although hot forming of magnesium by the drop hammer and the stretch form press can produce parts that could not be economically formed by other methods, both processes are limited in the amount of deformation they can produce. Part 3 of this series will cover forming of magnesium in the brake, hydropress forming and deep drawing.

Thread Replacements Hit Downtime Costs

At top, operator is removing damaged threads and cleaning holes in preparation for replacements.

Photo beneath shows casting with holes repaired with thread inserts now ready for use again.



DOWNTIME represents not only costs in time, but also the additional costs to manufactured items, costs in labor, and other related expenses.

One company has partially licked the problem by use of Heli-Coil Corp.'s stainless steel wire thread inserts wherever machine operations are impaired by worn or stripped threads. After friction, vibration, seizing, galling and corrosion has taken toll of threads tapped in industrial castings and machine housings, the threads may be quickly restored with thread inserts. First the damaged thread is cleaned out and retapped; then a stainless steel wire thread insert may be installed quickly in the hole with an inserting tool, thus bringing the hole back to its original size with a permanent thread. The operation is simple, quick and the equipment is restored to use after a minimum downtime.

Time and cost savings up to 80 percent have been reported when comparing the Heli-Coil wire thread insert method of thread repair with previous methods. Durability of these wire inserts is due mainly to their being manufactured to a diameter slightly larger than the hole, than being installed under compression, which gives the spring-like thread inserts a self-locking quality. However, should removal become necessary, an extracting tool makes the operation a quick and simple one.

Fig. 1 Vibrating hopper feed at lower right loads magnets into special disk fixture for finish grinding on both ends.

MAGNET PRODUCTION
mechanized at new plant

PERMANENT MAGNETS, passing through production processes at Carboloy's new plant in Edmore, Mich., must be demagnetized after magnetization and aging. For the many subsequent processes involved, demagnetization is necessary, otherwise the magnets would adhere and make handling, inspecting and grinding, *Fig.* 1, difficult.

At peak production the plant will produce magnets of over 2,200 varied shapes and sizes. Two distinct methods of production—sand casting and sintering—are employed. Unlike other foundries, however, baked sand molds or core slabs are used exclusively. Core slabs are baked for three hours at 400 F depending on thickness. When used they are sandwiched between steel plates with a pouring spout on top to receive molten metal from an induction furnace, *Fig.* 2.

Tiny magnets and those requiring closely controlled dimensions or high physical properties are more economically produced by sintering. Sintered magnets are finer grained than cast magnets, giving a more uniform flux distribution and greater strength. Fine metal powders are fed from a hopper into die cavities and compressed under 35 to 50 tons per square inch. Allowance is made in pressing to accommodate three to seven percent linear shrinkage which occurs during the process. Small sintering presses in the plant have a daily output of

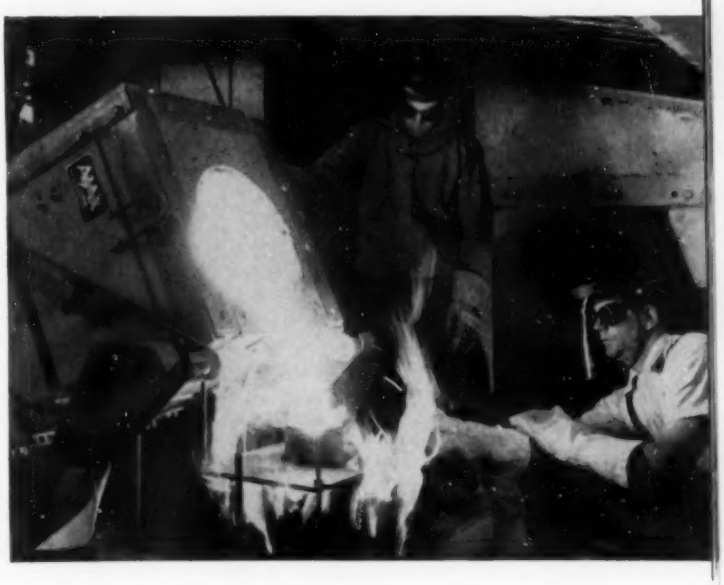


Fig. 2 Molten metal enters pouring cup as worker ignites gasses escaping between stacked core slabs.

about 27,000 pieces.

Constant checking of chemical composition is important for standardization of the heat treating process. Melts not conforming to rigid specifications are not processed. Material quality is maintained with an electronic direct reading spectrometer, *Fig.* 3, checking the chemical content of each batch within 0.1 percent for each alloying element.

High-cobalt directionalized Alinco magnets receive their high magnetic qualities through proper heat treating. After rough grinding to remove flash, magnets are placed in trays and heated in a roller-hearth furnace, *Fig.* 4, first in the industry. These magnets then enter direct-current solenoids for directionalizing.

Aging, final step in magnet heat treatment, consists of holding magnets for five hours at 600 C to refine the metallurgical structure for maximum magnetic properties. Aging furnaces are set in the floor to one-half their height for convenient loading. Magnets are then demagnitized, *Fig.* 5, sand blasted and finish ground.

Due to Alinco's inherent hard and brittle qualities it would be costly to grind the magnets from large stock shapes. For this reason they must be cast close to final dimensions and finish ground.

Because grinding operations influence the cost of magnets, work is underway to improve mechanization. A specially designed double-spindle disk grinder, *Fig.* 1, departs from conventional grinding machines, and is an important step in this direction. This grinder holds the work rigidly in a rotating fixture while abrasive wheels turn in opposite directions about the same axis to grind the magnet ends. Speaker magnets, one of the many types of magnets produced at Edmore, are fed by vibratory hopper.

Magnets are sprayed with hot cleaning solutions to remove foreign matter in preparation for final inspection. Tests are designed to fit the appropriate shapes and types of magnets.

Fig. 3 Chemical analysis is determined with this direct reading spectrometer. Metal samples in bar form are checked for content in five minutes.

Fig. 4 Ring magnets travel on conveyor rollers through heat treating furnace. As magnets reach the discharge end a signal alerts the operator.

Fig. 5 After aging and sand blasting magnets are demagnitized. Operator loads wheel carrier which passes parts through demagnitizer and drops them into trays.

TOOL ENGINEERING in Action

Modular Assembly
assures production flexibility

By John W. Greve

Editor

ASSEMBLY AND MAINTENANCE of conventionally designed electronic equipment would require more manpower than would be available in a national emergency. Realizing this, the Navy initiated an intensive research and development program in automatic assembly methods. Called Project Tinkertoy by its sponsors, this program has developed into a system of design and methods of production. In this system, "silk-screen" printed electronic circuits and components not only are made in automatic machines but also are assembled into basic units or building blocks called modules, *Fig.* 1. Producing standardized and uniform parts from raw materials, these automatic machines have designed into them the necessary production skill and know-how, requiring only simple modifications for product design changes.

In developing the project, two major objectives

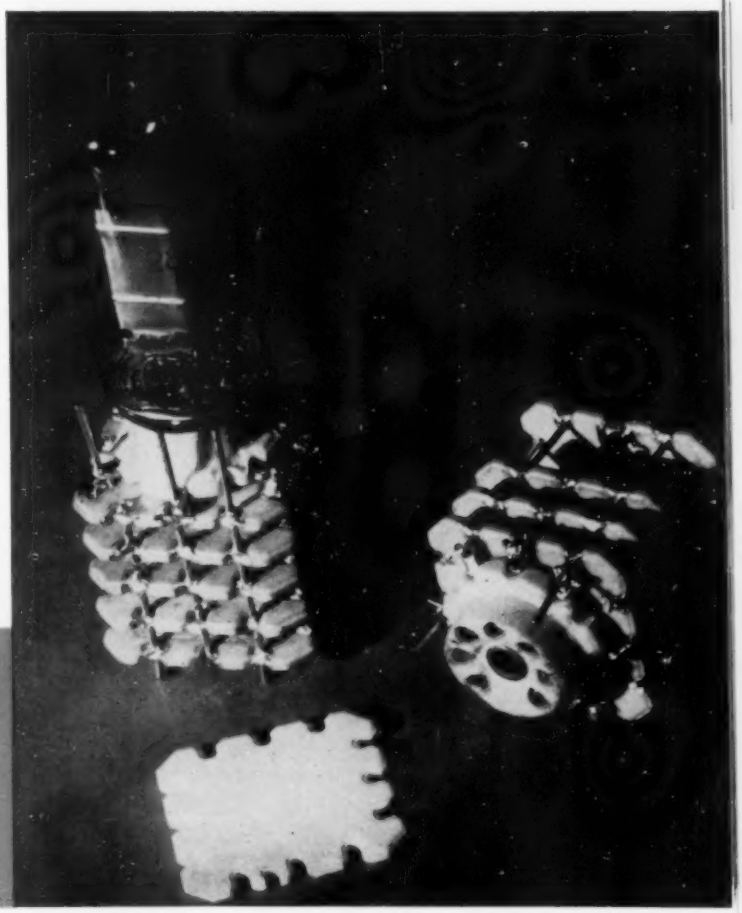


Fig. 1. Machine-made module is equivalent to one electronic stage including resistors, capacitors, circuits and tube base. Ceramic wafer in foreground is the basic element in a module. Circuit paths are printed on each side, and capacitors and resistors are attached. Riser wires mechanically hold the assembly and complete the circuit paths.

Robert L. Henry, serving as chief of process technology for the Electronics Division of the National Bureau of Standards, invented the basically novel system for the design and construction of electronic equipment discussed in this article. During the past three years, he directed this large-scale engineering project that resulted in the building of an automatic factory pilot plant to mechanically produce electronics. The program was under the sponsorship of the Navy Bureau of Aeronautics.

Storing technical know-how in the machines, his system of mechanized production permits rapid conversion from one type of electronic equipment to another, a significant factor should the country be faced with any military emergency. In bringing this project to fruition, Mr. Henry served as research scientist, design engineer, tool engineer, administrator and coordinator. He holds several patents relating to modular electronic design and assembly methods.

were of primary importance: First, the system should use manufacturing facilities that would be independent of external sources of supply, operating from raw materials under one roof. Second, the system should be flexible and adaptable to change quickly from one product to another. Also, it must be capable of incorporating modifications or improvements in the products without altering the mechanical features of automatic production and assembly machines. To prove the feasibility of production, a complete pilot plant was designed and is being operated to make these novel modular electronic devices.

Industrial experience has proved that, in general, automation leads to higher rates of production, lower unit costs and more uniform products. This should also be true of a Project Tinkertoy operation, however, to maintain the high degree of flexibility required by the major objectives, the process is not automatic between machines. Transfer boxes are employed for each individual lot of parts. These transfer boxes retain the same parts between operations until final assembly. In this way no parts lose their identity, punched cards identifying them through processing and testing.

By conservative estimates, ten times more electronic equipment would be required in a new emergency than was needed for World War II, which

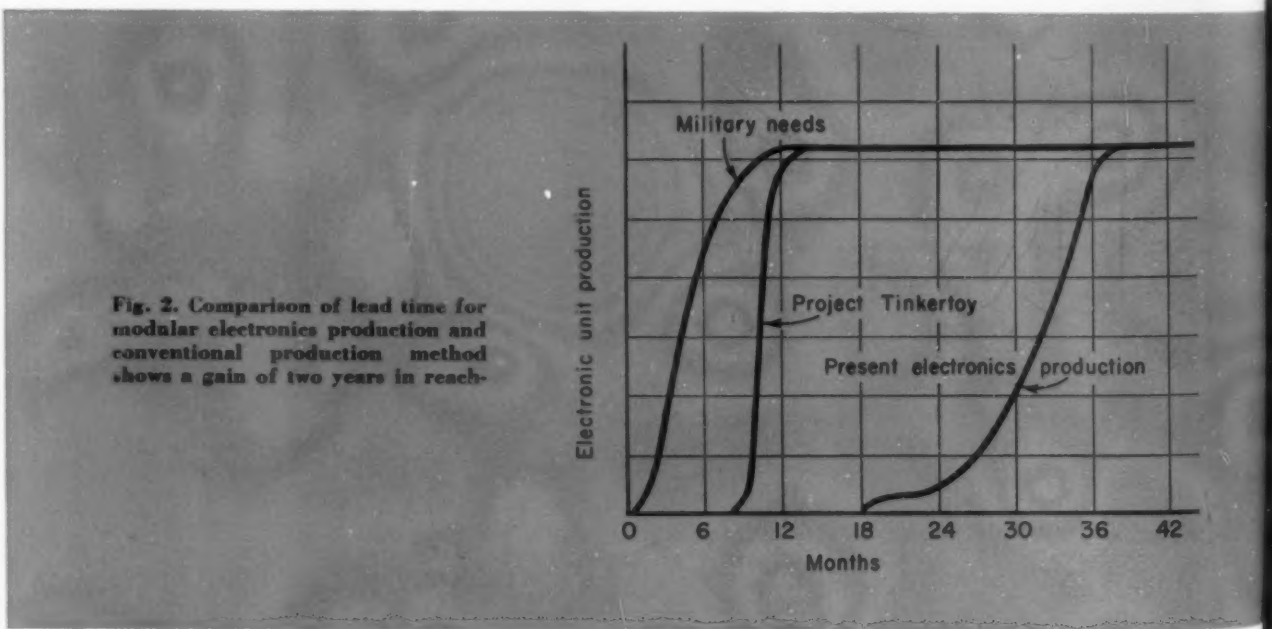


Fig. 2. Comparison of lead time for modular electronics production and conventional production method shows a gain of two years in reach-

TOOL ENGINEERING in Action

peaked at $4.4 billion in 1944. Compared with present electronic production methods, electronic unit production by the modular method of design could meet military requirements and be in full production in less than a year. Present methods, in addition to requiring considerably more manpower, would take three years before the same production rates could be met. *Fig.* 2 graphically illustrates this comparison, assuming the same date for freezing electronic equipment designs. If additional changes were involved, the module method could meet them quickly, reducing the lead time of conventional methods by as much as 75 percent.

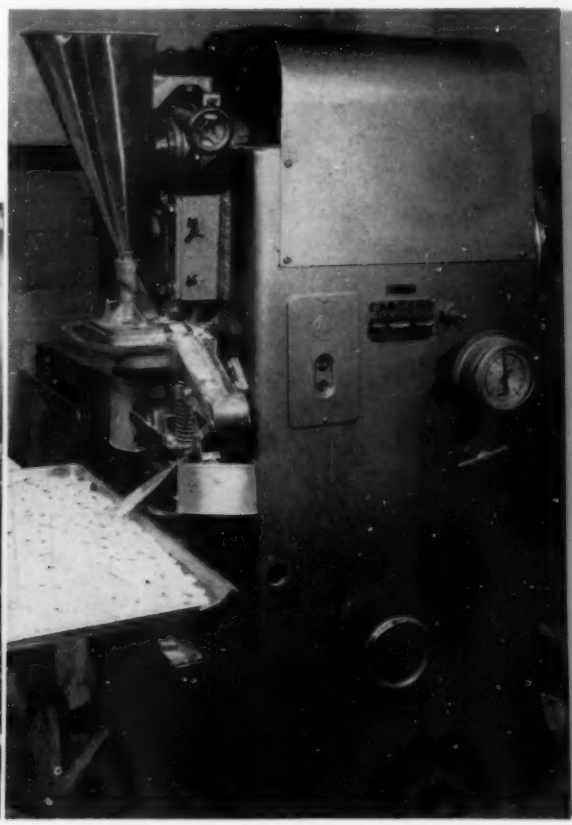
Conventional production of circuit components and assembly of electronic circuits involve manual wiring of each connection. The pilot plant shown in *Fig.* 3, however, produces resistors, capacitors, tube sockets and circuits, and assembles them into electronic stages. All of this is accomplished with little operator attention except for filling hopper feeders and for simple setup changes in the machines as required for different circuits. In addition, the various elements and components are checked in automatic testing machines for circuit characteristics or for faulty elements.

With the facilities of a pilot plant, it has been possible to work on product design and coordinate production methods in order to achieve the manufacturing flexibility desired. In this way, detail designs may be studied from production viewpoints, proving manufacturing feasibility in the plant. With production under complete control, the data gathered can be applied direct and projected accurately to industrial manufacture. All military services as well as the electronic industry are vitally interested in the information developed by the project.

The National Bureau of Standards had engaged in pioneering work in printed electronic circuits, stemming from problems arising in its proximity fuse work during World War II. Prior to 1950, the Bureau had developed a modular design concept, tape resistors, special circuit printing techniques and hand machines for printing circuits in connection with various research and development projects. Problems of miniaturization and ruggedization of electronic equipment had also been under study for some time. Concurrently, the Industrial Planning Division of the Navy Bureau of Aeronautics was conducting a study of industrial mobilization and preparedness. The results of their study indicated that the only solution to the problem of satisfying the huge demands for electronic equipment was a mechanized production system. Thus, early in 1950, a program was begun at the National Bureau of Standards under the sponsorship of the Bureau of Aeronautics that, three years later,

Fig. 3. (below) Automatic factory produces circuits and components from raw materials and assembles them into basic stages for electronic equipment.

Fig. 4. (right) Tableting press making green ceramic wafers.



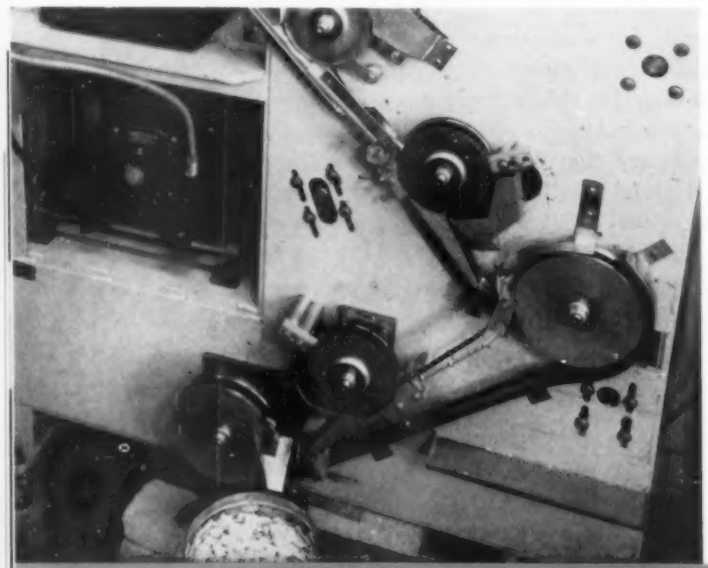
emerged as Project Tinkertoy.

Much of the basic work with printed circuits, miniaturization, and tape resistors had been accomplished prior to the inauguration of Project Tinkertoy. The techniques of printing by the silk-screen method were perfected so that the characteristics of capacitors as well as the entire circuit could be controlled and standardized. Considerable pioneering work* had also been conducted by J. A. Sargrove in England.

He designed an automatic machine to manufacture small, inexpensive radios. The experience gained from this venture was of inestimable help to NBS. His system was designed for the production of one product and lacked the flexibility needed for circuit changes. In his system, a plastic base plate is molded in a die with conductor channels in each side of this plate.

Zinc was then sprayed on the plate and the surfaces machined, leaving the conductors in the depressions. Capacitors were made by reducing the thickness of the plate. Inductors were large, flat printed spirals. Resistors were sprayed graphite. To make a change in design required six weeks involving new molds and numerous changes in the automatic machinery. Study of the Sargrove methods and experience with proximity fuses indicated that extreme flexibility was necessary for successful operation. The modular system is a promising answer.

*This work is reported in "New Methods of Radio Production," British Institution of Radio Engineers, Jan. & Feb., 1947.



Basic System: The design system, making manufacturing extremly adaptable and versatile, is based upon combining mechanically standardized and uniform modules to perform a wide variety of electrical functions. Printed circuits on as many as

Fig. 5. (left) Machine for gaging wafer dimensions. First stage checks thickness and camber (warpage). Second, third and fourth stages check for over and undersize across the flats.

Fig. 6. (below) Mechanized assembly line showing the progress of wafers through printing, testing and assembling machines. All machines are automatic with the exception of the plate assembler at the right end of the line.

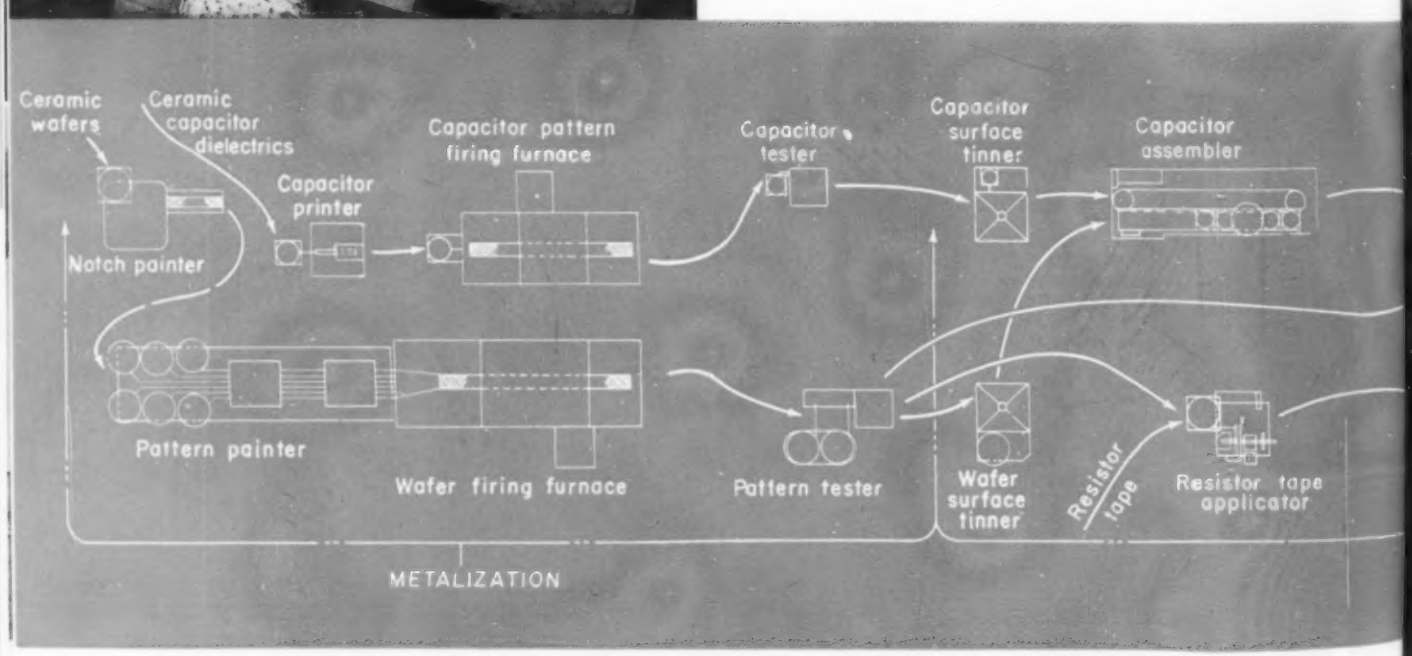


Fig. 7. Notch painter coats each of the twelve notches on the wafers without reorienting and dries the silver paint to prevent smearing.

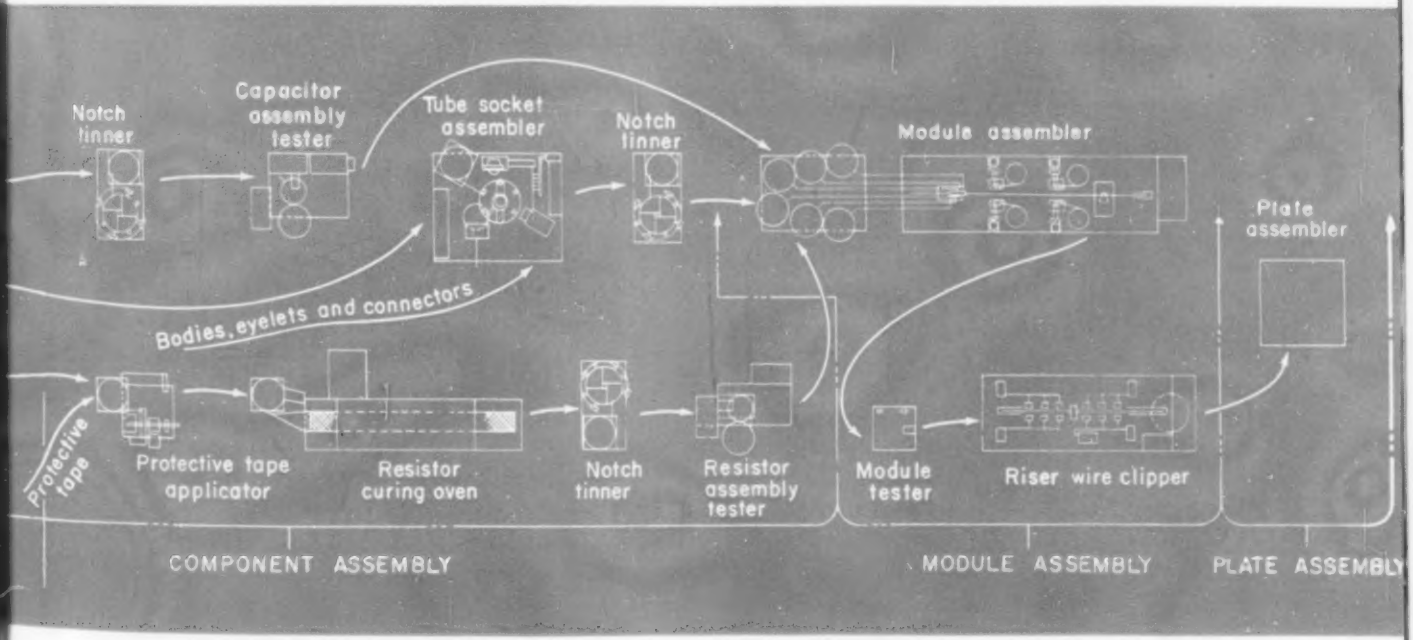
six thin ceramic wafers, to which are added capacitors and resistors, are combined into each module, the equivalent of an electronic stage. A number of individual modules combine to form a major subassembly. The composition of modules in this manner is possible because of the similarity between circuits in modern electronic units. Excepting electronic tubes, practically all parts employed are produced from raw materials in automatic machines.

Although the background research, conception of the system and development of manufacturing methods were contributed by the National Bureau of Standards, some of the detailed designs and construction of the production and testing equipment was performed by the Kaiser Electronics Division of Willys Motor Co., Doughnut Corp. of America, and Communication Measurement Laboratory.

Feeders: All of the production, assembly, and test machines, shown in *Fig.* 3, performing operations on the ceramic wafers, are fed by vibratory hoppers. Because the wafers have printed circuits and components attached, they must be properly oriented in each machine. For this reason each wafer has an index notch in the forward side of the wafer as shown in *Fig.* 1. To orient each wafer as it is fed into a machine, eight indexing stations are located on the spiral inclined feed path on the inside of the hopper wall. There being eight possible positions, the last station serves as a check before delivering the wafer to the machine.

These stations are so arranged that, if a notch matches a pin at any station other than the last, the wafer tips past the index pin to the track below. In this way the wafers are turned progressively until oriented properly for the check station.

Because of the additional mass of the orienting



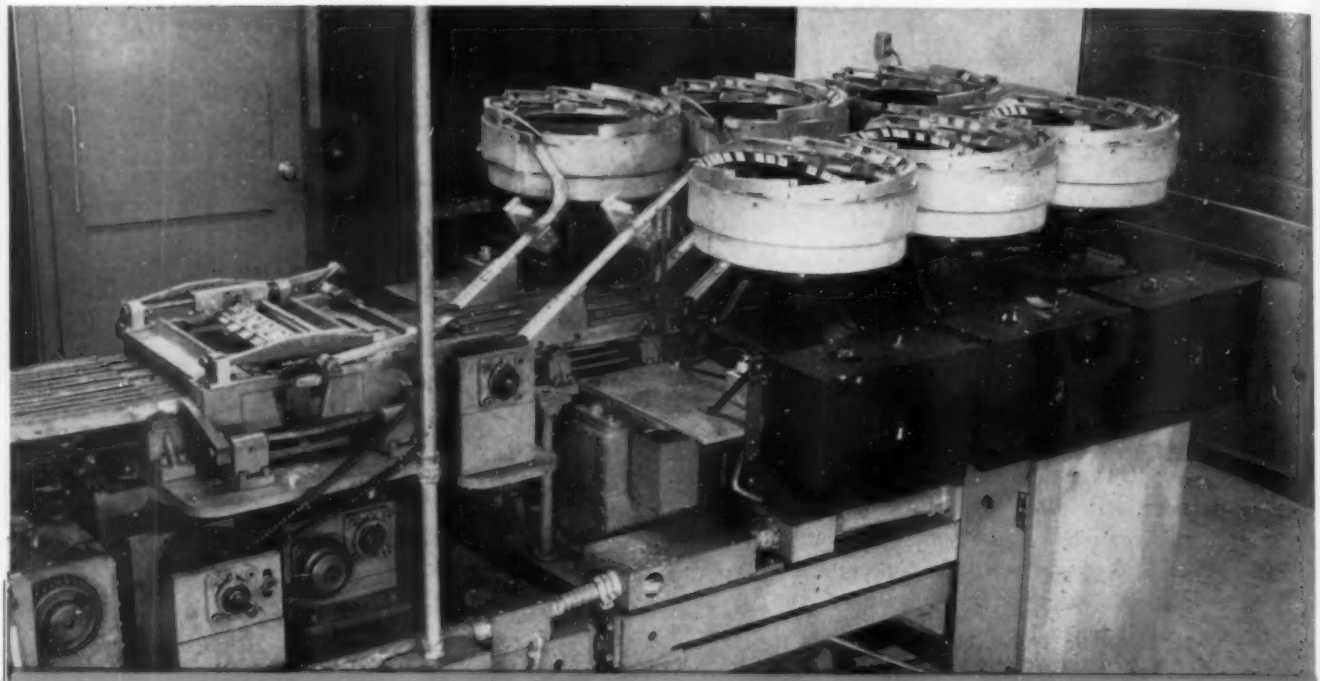


Fig 8. Silk-screen printer paints silver patterns on wafers fed by hoppers and six chain conveyors.

stations and the slide tracks, considerable development work was necessary to make the hoppers feed these thin ceramic wafers. The spring characteristics of the hopper support and the vibration frequency impressed on the hopper are critical for satisfactory feeding. Necessary resonance for the support was determined analytically and the vibration frequency determined with a variable-frequency unit.

Ceramic Production: Tube sockets and wafers are made of steatite porcelain containing 80-percent talc and controlled portions of kaolin and barium carbonate. The formulation is mixed wet and filtered in a press. The filter cake is broken up and dried, put in a muller with organic binders and then granulated to the consistency of salt and dried again. This powder is hopper fed into a tableting press and compressed at 10,000 psi in a die to make green compressed wafers, *Fig.* 4. These wafers are fired for 9 hours at 2350 F in a continuous furnace.

Finished wafers, $\frac{7}{8}$ in. square and $\frac{1}{16}$ in. thick, are sample tested for porosity under pressure in an alcohol bomb. Flash is removed by tumbling. An automatic gaging machine, *Fig.* 5, checks all dimensions.

Capacitor bodies are made in much the same manner as circuit wafers except they are a non-porous ceramic composed of magnesium, barium, calcium and strontium titanates of high purity. The wafers are $\frac{1}{2}$ inch square and 0.02 inch thick. Their capacitance values vary from 7 micromicrofarads to 0.01 microfarads. Five pounds of material produces about 100,000 capacitors, with about 80 percent being acceptable. Dimensions are not gaged automatically. The operator checks the thickness frequently because the ceramic is the di-electric and thickness is important. The other dimensions are unimportant inasmuch as the surface area is controlled by the printing of the silver on the faces. A final check is made for electrical characteristics in a testing machine after the surfaces are silver printed.

Metallization: Ceramic wafers progress into the metallizing section as shown at the left in the layout for the mechanized assembly line in *Fig.* 6. Circuit wafers are fed into a notch painter and the capacitor bodies into a surface printer. All of the wafers are treated in this way.

The notch painter, *Fig.* 7, is fed from an inclined chute with oriented wafers. To assure that a wafer will be in position for each chain driven workholder, a photoelectric unit is mounted midway on the chute. If for any reason a wafer is not present

TOOL ENGINEERING in Action

the painter stops until the hopper refills the chute.

Wafers are transferred horizontally onto the holders, each of which has two fingers to hold the wafer on each of the four edges. The fingers are positioned to clamp and hold between the notches. As the workholders continue to feed downward, four sets of three wheels, spaced to run in the twelve notches, paint them without reorienting the part. Silver flake (300 mesh) in a pang-oil derivative vehicle with ceramic flux for bonding the silver on the wafer is fed to the wheels from a reservoir. As the holders pass over the bottom idler sprocket, the wafers are released onto a wire conveyor. Infrared heat is applied in this section to dry the paint, preventing the silver from smearing.

From this point succeeding machines perform specialized operations requiring that the wafers be identified. This is accomplished with separate transfer boxes for each wafer type, a punched card identifying the lot. These cards remain with each box and its contents through the plant to the final assembly. They also set up the test machine for automatic 100-percent testing.

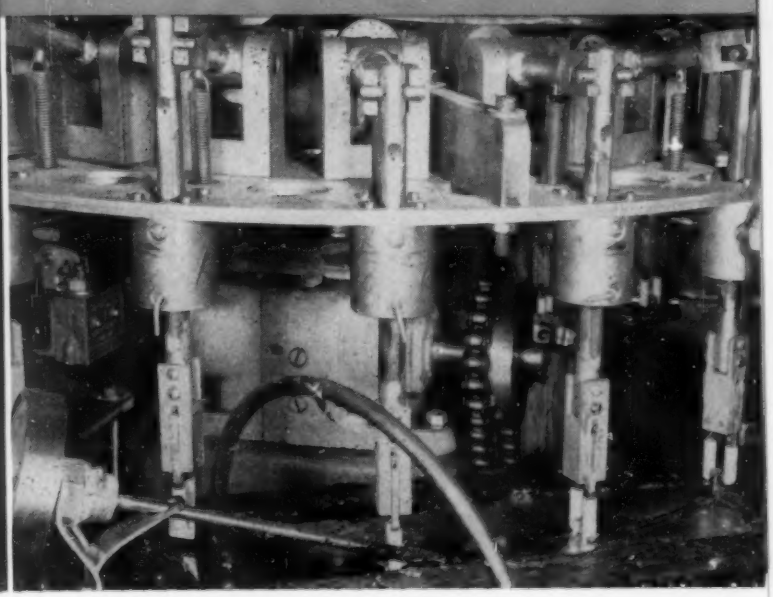
In the wafer pattern printer, *Fig.* 8, six hoppers with orienting stations feed six tracks to the printing station. The silk-screen printer, using a stainless-steel screen, uses a silver-base paint to form a conductive pattern. These printed wafers are fed by conveyors with chain dogs to a transfer conveyor with open-side buckets to prevent smearing. The buckets carry the parts to an oven for preliminary baking.

Held in oriented position, the wafers go through a similar printer to paint the other side. After the second printing they are dried again and then transferred to a spiral-loop conveyor, feeding through a continuous furnace at 1350 F to bake out organic binders and fuse the pattern on the surface like a glaze. From the furnace the wafers go to a circuit tester, *Fig.* 9. An orienting hopper feeds the printed wafers to a chute and into a test head where they are stopped momentarily for circuit check. The punched cards set up the control conditions by insertion in the machine.

Component Assembly: From this point, the wafers are separated into component assembly lines. Those with holes in the center are transferred to a machine for assembly with tube sockets. Those requiring resistors go to a tape-resistor applicator and

Fig. 9. (left) Pattern tester performs 100-percent check on printed circuit. Punched cards are locked in position in the tester by the knobs above the inserted cards.

Fig. 10. (below) Solder pot station in tinning machine. Wafers are lowered into molten soldier by a cam track controlling a pivoted arm on the workholder assembly.



those to which capacitors will be applied go to a surface tinner, *Fig.* 10, before the capacitors are attached. This unit is an indexing dial machine, which holds the wafers vertically between two mechanical fingers. The holders are progressively lowered into flux, solder pot, wash and rinse by an arm pivoted by a cam track. This tins the silver circuits and initially tins the painted notches.

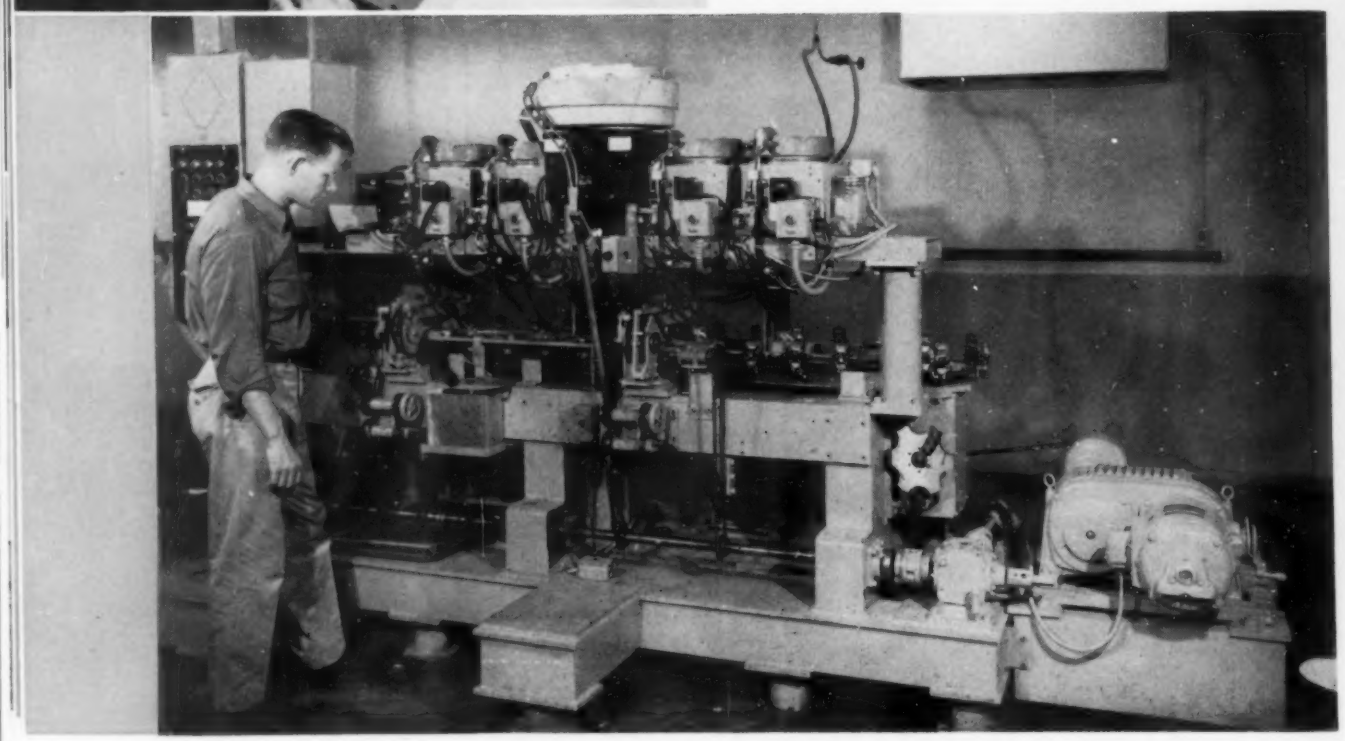
Meanwhile the capacitor bodies are being printed in the machine illustrated in *Fig.* 11, tested and tinned in a similar manner, reaching the capacitor assembly machine with the circuit wafers. This machine, *Fig.* 12, has four hopper feeds for selectively attaching capacitors and an orienting hopper for supplying the circuit wafer. Assembly is progressive at stations along the conveyor, the assembly being soldered in an induction heating unit at the last station in the machine.

From this machine the wafers go to a notch tinner which dips each edge into solder, filling the notches sufficiently for attaching the riser wires in the module assembly machine. Before assembly into a module, however, the capacitor units are tested for value and breakdown in a two-station dial machine.

Those wafers to which resistors are attached go direct from the wafer pattern tester to the resistor tape applicator shown in *Fig.* 13. Capable of applying either one or two resistors to each side of a wafer, the machine is supplied from two rolls of ½-inch wide resistor tape on each side. The ma-

Fig. 11. (left) Fed from a hopper, capacitor wafers are pushed by a rod into open fingers each time the machine indexes. A phototube assures a wafer is in position before machine indexes into position in the silk-screen printing station.

Fig. 12. (below) Machine for selectively assembling up to four capacitors on a wafer. Assembly is soldered in an induction heater.



TOOL ENGINEERING in Action

chine cuts the tape to length and attaches it on the ceramic wafers at the proper place in its circuit. Firing in a furnace fuses the resistors permanently. Notch tinning in a four-wheel machine for later attachment of risers in the notches and testing of the resistors completes the operation on the wafers for delivery to the modular assembly machine.

As mentioned previously, wafers having holes for tube-socket assembly go to an assembly machine direct from the pattern printer and tester section in the metallizing department. This assembly machine is loaded with ceramic tube-socket bodies, printed wafers, a reel of tube-pin connectors, and eyelets for attaching the socket to the wafer.

The tube-pin connectors are formed in an 11-station die set on a punch press. The connectors are formed from beryllium copper strip and are not separated, permitting them to be wound on a reel as shown in *Fig.* 14. While on the reel, the connectors are electroplated before delivery to the socket assembly machine.

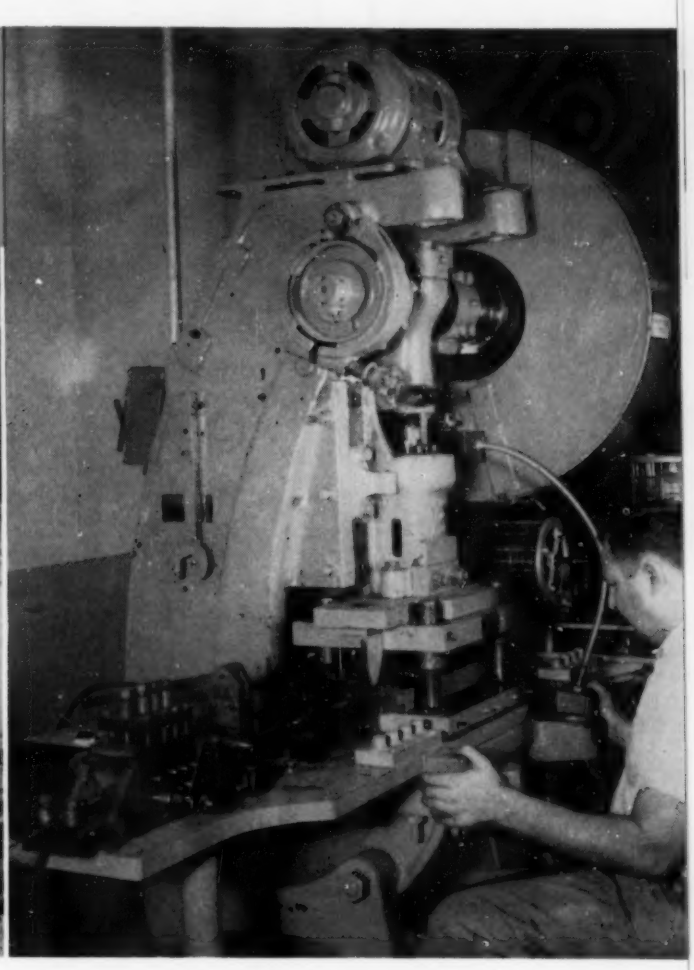
Like the other wafers, the socket units are tinned in a four-station machine to fill the wafer notches for attachment of the riser wires. Special components that may be required—other than resistors, capacitors and sockets—are assembled by hand when dimensions permit modular spacing.

Module Assembly: Uniform wafer-mounted component parts are assembled into modules in the single machine shown in *Fig.* 15. Having six orienting hoppers a standard module may contain as many wafers. These hoppers are loaded with the selection of wafers for the circuit desired. Chutes from the hoppers feed into a fixture for positioning the wafer elements. The clamped fixture is chain fed to the first of two soldering stations, *Fig.* 16. There six riser-wire reels feed the wires, three on a side, along the wafers at the notch positions. Special heated heads approach and solder by jamming the wires into the notches which have been loaded with solder.

As the fixture travels to the next station, it is rotated 90 degrees on its axis of travel by a cam roller on the fixture. A pair of similar heads solder riser wires on the sides adjacent to the first set. The wires are cut from the reels at each station and the fixture continues to the unload station and de-

Fig. 13. (below) Resistor tape applicator attaches resistors, as required, on both sides of a printed wafer.

Fig. 14. (right) Press with 11-station die set forms beryllium-copper strip into tube-pin connectors. The short narrow segments are left joined to permit winding on a reel.



posits the module in a transfer box.

A final testing machine checks modules at the rate of 500 per hour, using a punched card for setting up the test. This machine records accepted and rejected units.

In addition to being structural parts of the assembly, the risers are circuit paths between the wafers and terminal connections, making it necessary to clip the wires as required by the circuits. A clipper machine clips the wire extensions that are not required and also wire sections between the wafers. The clipping action is performed by preset solenoid units as the module is indexed past twelve clipper heads. The module is rotated 90 degrees at the machine midpoint to clip the second set of six riser wires.

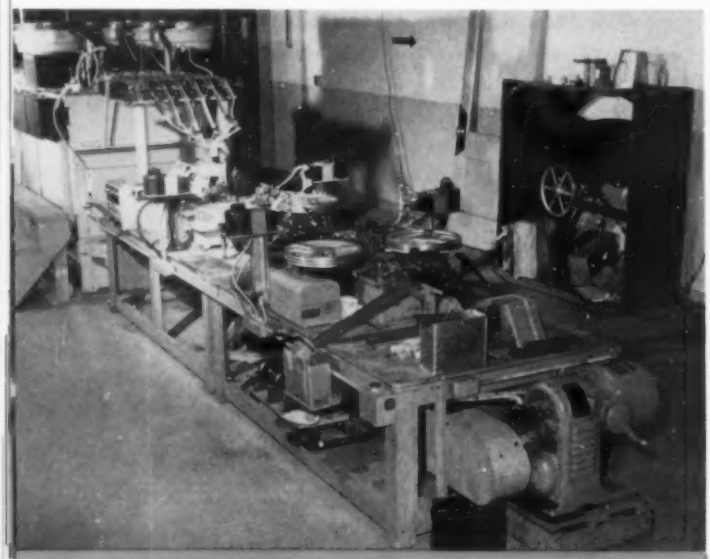


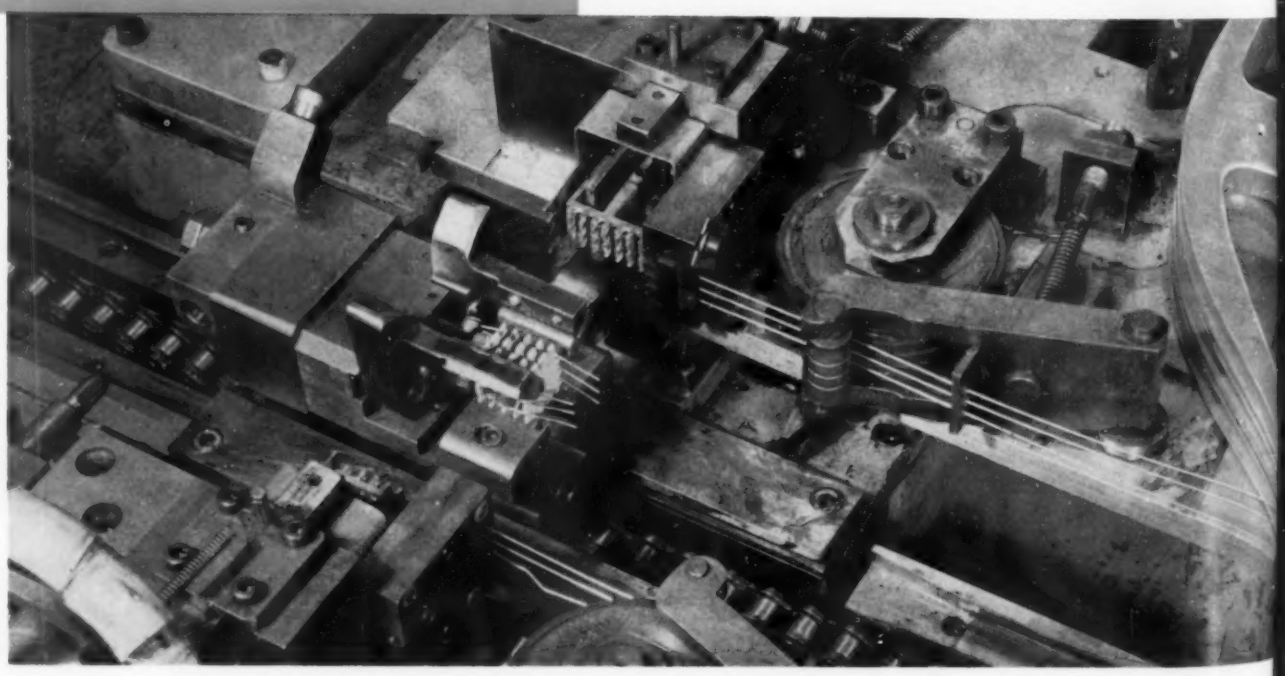
Fig. 15. (above) Module assembly machine makes any electronic circuit capable of being contained within six ceramic wafers in the spacing allowed in the standardized unit.

Fig. 16. (below) Station in module assembly machine showing fixture and special heads for soldering riser wires.

Equipment Assembly: Although not necessarily a part of Project Tinkertoy, facilities for assembly of modules into electronic equipment have been incorporated for plate assembly of units. Copperclad plates are silk-screen printed with an acid-resistant paint and treated in ferric chloride bath.

This leaves only the circuit paths of copper which were protected by the paint. After the plate is drilled to receive the riser wires of the modules, the wires are placed in these holes. With flux on the wires, the assembly is placed in a fixture and lowered into molten solder. The solder rises in the holes to finish the assembly.

Performance of equipment produced by this method meets military environmental requirements, passing such tests as shock, vibration, temperature, and humidity established in military specifications. The standardization and uniformity of the modular design result in production outputs whose characteristics are carefully controlled. The 100-percent inspection machines are an integral part of the automatic production line.



Machining Stainless Steels

WHILE THE WIDE RANGE of stainless steels represents a considerable variation in machinability, the information presented here, by courtesy of the Metal Cutting Tool Institute, is focused primarily on the types that are less machinable. The most difficult problem, severe and troublesome in Austenitic grades, is work hardening. Its complete elimination is impossible, but it can be minimized and effects overcome with good tooling practice. Rigidity in machine tool beds and frames, milling machine overarms, drill press heads and tables is essential. Important also are adequate stiffness and good fits in arbors and other tool holders and guides.

Permissible feeds and speeds are frequently limited by the rigidity of machines, tools, and fixtures. A gain in production rate is often achieved, along with a quality improvement and increase in tool life, by devoting greater attention to this factor.

High Speed Steel Milling Cutter Design for Stainless Steel Milling

Type of Tool	Radial Rake (hook or undercut) (deg)	Axial Rake (helix or shear angle) (deg)	Peripheral Relief (primary clear.) Cutter diameter, small (deg)	Peripheral Relief (primary clear.) Cutter diameter, large (deg)	Width of land Cutter diameter small (in.)	Width of land Cutter diameter large (in.)	Special Features to Consider
Plain Mill Slab Mill	10 20 **30**	**15** 30 50 70	**8**	6 **3**	1/64 1/32	1/16	Alternate chip breakers, notches
End Mill	10 20 **30**	**15** 30 50	10	5	0.010	1/32	
Face Mill Straddle Mill	10 20 **30**	10 20 **30**	**8**	5 **3**	1/32	1/16	Chamfer or radius or large bevel angle
Saws	0 10 **20**	0 15	8	5 **3**	1/32	1/16	Alternate high-narrow and low-wide teeth, alternate chamfer
Slotting Cutters Side Mills Stag. Side Mills	10 20 **30**	0 15	**8**	5 **3**	1/32	1/16	Chip breakers, Alternate chamfer with 0° axial rake
Form Relieved Cutters	0 10 **20**	**0** 10	**15**	**10** 3			Partial or staggered teeth
Form Relieved Thread Milling Cutters	0 10 **20**	**0** 10	**15**	10 3			Partial or intermittent teeth
Misc. Profile Cutters	0 10 **20**	**0** 15	8	5 **3**	1/32	1/16	Intermittent, alternate or staggered teeth.

Note: **The light face figures show the ordinary range.**

Milling Stainless Steels: The problems in milling stainless steels involve the relatively high amounts of heat and friction developed and the tendency of some grades, particularly the austenitic chrome-nickel series, to work harden. To minimize the difficulties it is general practice to slow down the speed and take a heavy, continuous cut. The interrupted nature of the cut and the wedge shape of the chip are not conducive to good tool life and efficiency. Form milling, depending upon the nature of the form, may cause particularly unfavorable chip thickness. Under some extreme conditions it may be wise to consider the advisability of broaching, see sketch below.

A flat surface is best milled with a face milling cutter. Face milling removes metal at a fairly constant chip thickness. The same holds true for plunge cutting. For all other milling operations climb cutting is preferable to conventional cutting.

The milling cutter design should use a positive radial rake, hook or undercut as great or greater than that for ordinary steel milling in order to facilitate parting the chip from the workpiece and to reduce heat generated. It should usually be from 10 to 20 deg positive with an overall range from positive 5 to 30 deg for special applications.

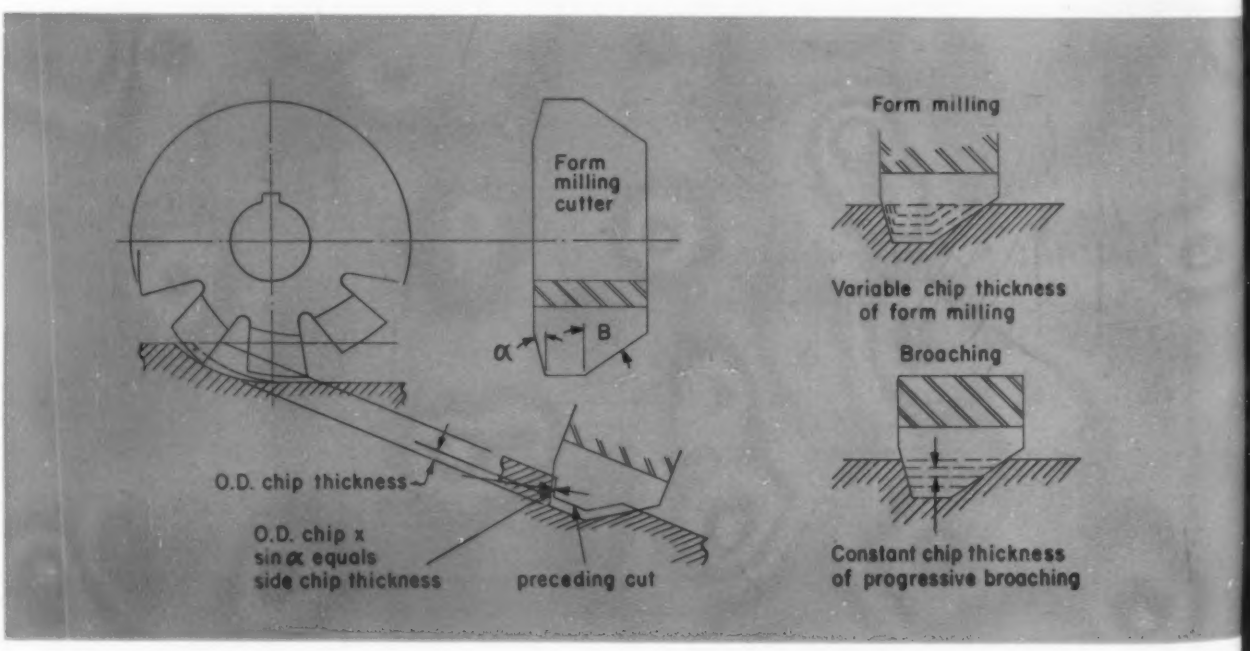
Axial rake or helix angle of a high degree is desirable to promote smooth cutting action, provided it does not introduce a chip disposal problem. On saws and slotting cutters for confined cuts it may be from 0 to 15 deg. On end mills and plain mills, it may be from 15 to 50 deg positive. On angular cutters or intricate profile or form relieved cutters the axial rake must be varied to suit the shape of the cutting edge and the part, keeping the true rake positive and providing for good chip disposal.

Peripheral relief angles for average milling are around 5 to 6 deg but may be 10 deg or more on small end mills and as low as 3 deg on larger diameter cutters. The relief angles should be as small as possible without letting the heel of the land interfere with the work.

Milling Speeds Using High Speed Steel Cutters

No.	Type of Steel (AISI No.)	Milling Speed (sfpm)
	Austenitic	
1	301	40 to 60
2	302	40 to 60
3	302B	—
4	303 FM-S	50 to 80
5	303 FM-Se	50 to 80
6	304	40 to 60
7	305	—
8	308	—
9	309	30 to 50
10	310	—
11	314	—
12	316	30 to 50
13	317	30 to 50
14	321	40 to 60
15	347	40 to 60
	Martensitic	
16	403	40 to 60
17	410	40 to 60
18	414	40 to 60
19	416 FM	50 to 80
20	420	35 to 50
21	420 F FM	35 to 55
22	431	—
23	440A	30 to 50
24	440B	30 to 50
25	440C	30 to 50
26	440F	35 to 55
	Ferritic	
27	405	40 to 60
28	406	—
29	430	40 to 60
30	430F FM	50 to 80
31	442	—
32	443	—
33	446	40 to 60

Note: Thread milling cutters are an exception to the general rule. Cutting speeds are usually 40 to 80 percent higher.



Drilling Stainless Steels: Drills used in free machining grades of stainless are commonly sharpened with an 118 to 135 deg included drill point angle with somewhat less lip relief than the usual 8 to 12 deg relief angle. Since these grades are drilled at speeds high enough for heat generation to be a factor, water soluble oils are generally used because of superior cooling qualities.

The 18-8 types and similar stainless steels such as AISI 304, 308 and 310, are difficult to drill because of work hardening properties. Heavy duty drills of the cotter pin or crankshaft type are consequently used. When possible short fluted drills are employed to provide greater rigidity, especially in deep hole drilling. Drills having higher than regular helix angles such as heavy duty and crankshaft types, have been used with success in deep hole drilling, particularly in the smaller drill sizes where chip removal is a factor.

Drills used in the chrome-nickel types are usually sharpened with 135 to 140 deg included drill point angles and with 6 to 8 deg lip relief. Because of work hardening the proper thinning of the drill web at the point is quite important. This will reduce the rubbing action of the chisel edge. The reduction in web thickness can be accomplished by notching or split pointing.

Work hardening types usually require the use of sulphurized and chlorinated mineral fatty oils as coolants. Sometimes water soluble oils in richer mixtures than those ordinarily used are satisfactory.

In drilling with portable tools the drills should be of short length for maximum rigidity. The web should be thinned, as discussed previously, a split point being commonly used. If the speed of the portable tool is too high extreme difficulty will occur when trying to drill holes by hand pressure. This is paricularly true when the drill size is in the upper range of the capacity of the machine. To avoid this condition a portable tool should be chosen to give compatible peripheral speed for the size of drill. It should have a sufficient power to maintain the speed under load. In portable drilling the rate of feed is important also, and for best results should be as steady and uniform as possible.

Though most drilling is performed successfully with convential high speed steel types some stainless steels are abrasive enough to reduce the tool life considerably. In these instances high speed steel drills with a higher than normal vanadium content will provide a substantial increase in tool life. Cobalt type HSS drills have also been successfully used in types of stainless which have been cold worked or treated for greater hardness.

Drilling Speeds for Stainless Steels

Free-Machining Grades		Chrome-Nickel Grades		Grades Non-Work Hardening Tough Machining	
Type (AISI No.)	Drill Speed (fpm)	Type (AISI No.)	Drill Speed (fpm)	Type (AISI No.)	Drill Speed (fpm)
416F	60 to 90	301	15 to 40	403	35 to 70
420	30 to 60	302	20 to 40	410	35 to 70
420F	70 to 90	303	30 to 80	414	40 to 60
430F	70 to 100	304	20 to 40	—	—
440F	50 to 70	309	20 to 50	430	30 to 60
—	—	310	20 to 40	440A	20 to 40
—	—	314	20 to 40	440B	20 to 40
—	—	316	20 to 50	440C	20 to 40
—	—	321	30 to 50	442	30 to 50
—	—	325	20 to 40	446	40 to 60
—	—	347	30 to 50	443	30 to 70

Drill Feeds

Under ⅛ in.	Dia-0.001 to 0.002 in.
⅛ in. to ¼ in.	Dia-0.002 to 0.004 in.
¼ in. to ½ in.	Dia-0.004 to 0.007 in.
½ in. to 1 in.	Dia-0.007 to 0.015 in.
Over 1 in.	Dia 0.015 to 0.025 in.

Note: For work hardening types increase from 25 to 50 percent over above values. Use greater percentage for smaller drills.

Reaming Stainless Steels: Straight fluted reamers or right hand spiral fluted reamers should be used, particularly for those types which work harden. The negative rake of the left hand spiral fluted reamer has a tendency to glaze and work harden the work surface. Cutting edges of the reamer must be kept sharp and free from burrs or build-up.

Alignment between reamer and hole must be accurate. Misalignment causes the back section of the flutes to cut on the side of the hole being reamed resulting in a torn, oversize and bell-mouthed hole. To avoid this condition the reamer is sometimes ground with additional back taper on the rear portion of the flute, leaving 25 to 40 percent of the front portion as originally ground.

Reaming feeds should be heavy enough to prevent glazing. A minimum of 0.001 to 0.002 in. per reamer tooth is common.

Carbide tipped reamers are frequently used on work hardening types of stainless and on those with a high carbon content for increased tool life.

Reaming tapered holes is difficult because of the tough, stringy character of the chips. As heavy feed pressures are needed, reamers must be very sturdy. Finish may have to be partially sacrificed for stronger tools with fewer flutes.

Screw cutting oils and sulphurized mineral oils are commonly used as coolants.

Reaming Speeds for Stainless Steels

Type (AISI No.)	Speed (fpm)	Type (AISI No.)	Speed (fpm)	Type (AISI No.)	Speed (fpm)
301	15 to 35	403	20 to 50	440A	15 to 30
302	15 to 30	405	20 to 50	440B	15 to 30
303	20 to 40	406	20 to 50	440C	15 to 30
304	15 to 35	410	20 to 50	440F	30 to 50
309	15 to 30	414	20 to 40	442	15 to 30
310	15 to 40	416F	30 to 60	443	15 to 30
314	15 to 30	420	15 to 30	446	15 to 30
316	15 to 30	420F	30 to 60	—	—
321	20 to 40	430	20 to 40	—	—
325	15 to 30	430F	30 to 50	—	—
347	20 to 40	431	20 to 40	—	—

Tapping and Threading Speeds for Stainless Steel

No.	Type of Steel (AISI No.)	Speed (sfpm)
	Austenitic	
1	301	10 to 20
2	302	10 to 20
3	302B	
4	303 FM-S	15 to 30
5	303 FM-Se	15 to 30
6	304	10 to 20
7	305	—
8	308	—
9	309	10 to 20
10	310	
11	314	
12	316	10 to 20
13	317	10 to 20
14	321	10 to 20
15	347	10 to 20
	Martensitic	
16	403	10 to 25
17	410	10 to 25
18	414	10 to 25
19	416 FM	15 to 35
20	420	10 to 20
21	420F FM	15 to 25
22	431	10 to 25
23	440A	5 to 15
24	440B	5 to 15
25	440C	5 to 15
26	440F	10 to 20
	Ferritic	
27	405	10 to 25
28	406	—
29	430	10 to 25
30	430F FM	15 to 40
31	442	—
32	443	—
33	446	10 to 25

Note: Due to the low surface speeds at which Stainless Steel is threaded, the horsepower requirements are also comparatively low and motor sizes suitable for threading mild steel are ample.

Tapping and Threading Stainless Steels: Tapping stainless steels of the free cutting grades is usually fairly easy, but the tougher grades sometimes appear almost impossible to tap. Many difficult jobs can be simplified by proper consideration of the threading operation in the design of the part. Deep threaded holes may cause trouble because of chips, especially on blind holes. For these the deepest possible drill depth beyond the tapped portion should be specified to provide space for chips. This is important even when thread depth is short.

Holes threaded less than full length should be designed with an undercut at the bottom of the thread so the tap can complete the cut before reversing, otherwise a tough, work hardened chip is left attached to the work.

Threading with die heads and collapsible taps is generally easier than with solid taps as it is unnecessary to back out of the work. Standard chasers are used although the grind is usually modified slightly. Die head chasers for straight threads should have approximately 15 deg hook except that tangent and circular type chasers are used with a rake angle of 20 to 25 deg.

As the cut is fairly heavy, and galling is usually a problem, sulpho-chlorinated petroleum oils containing active sulphur are recommended. Oil flow should be directed into the hole rather than at the tap, with sufficient pressure to wash chips away as much as possible.

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A Look to the Future

Harry E. Conrad

Executive Secretary

American Society of Tool Engineers

While it is true that The American Society of Tool Engineers has experienced what well may be considered spectacular success since the end of World War II, certain changes have occurred and specific trends are taking shape which should be scrutinized.

During the period of rapid expansion and accomplishment, there has been a tendency to overlook some of the basic principles on which ASTE has been founded. However, in light of recent developments, it would be wise to pause for a moment to take stock of what has happened, what is happening, and of what is going to happen as far as can be predicted.

In dealing with these essentials which make The American Society of Tool Engineers *what it is*, a review of some of the fundamentals involved cannot be overemphasized.

The philosophy upon which the Society has been founded reduces to a very simple element—call it self-improvement. All other ingredients making for the composition of ASTE stem from and revolve about this single element. How potent this main substance becomes depends on only two catalysts—interest and cooperation.

Whether the seeker of this element wears the garb of the "man in the shop" or the "dinner jacket of the speakers' table," his desires cannot be denied.

Because The American Society of Tool Engineers provides an opportunity for the *individual* (whether formally educated or not), who seeks self-improvement, this formula becomes the secret of the success of our organization. It is this essential which has taken ASTE out of the ranks of technical societies and *fostered its growth and present day position* as a leader in the technical society field.

No one can dispute that "loads of activity" and "bushels of enthusiasm" are wonderful! But activity and enthusiasm, not properly directed, can create confusion and chaos beyond imagination. Undirected activity may result in "biting off" more than can be assimilated. Undirected enthusiasm may lead us into forgetting our past lessons and making yesterday's mistakes again today and tomorrow. Forgetting errors of the past condemns us to repeat them in the future.

Some of the programs and policies being suggested at the present time have already been tried and proven unsatisfactory. To be specific, the present sentiment to change the numerical make-up of the Board of Directors should be most carefully examined. There was a time in the Society's past when the Board of Directors consisted of more than the present number of members. It proved to be undesirable and was changed to its present status in the interest of greater efficiency. We might ask a question at this point—has it proved otherwise? Another point to be considered—is the present clamor for change brought about by enthusiasm for personal recognition for so-called "favorite sons"?

Above all, we cannot lose sight of the purpose of the Board of Directors. Its function is and must remain administrative at the top executive level. It is not intended to be nor is its function that of representation. Other bodies within the Society's structure are charged with the responsibility of representation, and in order to maintain the proper functioning of the over-all activity, specific authority must be properly channeled.

Another matter worthy of note is the question of some type of regional system. This, too, was tried and abandoned in favor of a national committee program which, if properly executed, automatically eliminates any necessity for creating "regions" and the many concurrent problems common thereto. Unity of purpose, as well as unity of operation, is vital! Sectionalism presents a serious danger to our type of organization and must be guarded against at all times.

At this point, it is well to consider the membership of ASTE. Who are its members? What do they do? And how can their interests best be served?

Highlights from the Executive Secretary's report presented Oct. 30, at the semiannual meeting of the Board of Directors.

Certainly, we cannot overlook the basic philosophy of ASTE—self-improvement—and that it is our avowed purpose to attain professional status and gain such recognition by means of the activities and program sponsored by the Society.

Disregarding euphonic nomenclature completely, our membership divides itself into two distinct classifications, engineers and specialized technicians. There are men with formal educations in both classifications, as well as men without formal educations in both groups. The engineer and specialized technician must be served but in a somewhat different manner. Natural ingenuity plays a vital role in the progress of the individual tool engineer and the limitations of his advancement often hinges on this inborn ability.

Could not a more direct educational impact be delivered by diverting funds currently being spent on national scholarship awards, to encourage larger participation through student chapters? Scholarship awards benefit only a comparative few, while on the other hand, healthy student chapters could serve the dual purpose of assisting in the training of engineers and providing a greater medium for ASTE's closer association with the nation's educators.

Individual scholarships are better presented as a chapter activity where the local community spirit and personal relationships can be utilized to better advantage. Chapter-sponsored scholarships provide the rally and focal point around which the local ASTE members and industry can meet on common ground to work on a project of mutual interest. The value of this type of industry-chapter cooperation is of inestimable help to the chapter.

Closer liaison of our national committees with the chapters is another specific answer to the many problems common to the rapid expansion of the organization.

Expansion of national committees, insofar as the number of members participating is concerned, presents another problem which must be recognized to the fullest.

There is no bottom to the reservoir of ability in the membership ranks of ASTE. This talent must be brought to the forefront so we can draw upon this great reserve for the continued success of ASTE's programs.

Appointments and elections must always be confined to men of outstanding ability and for no other reason. There is honor and personal satisfaction in every position and those who are placed in responsible posts within the Society must first be capable administrators and, secondly, they must know ASTE, with its many facets of operation.

With the strength of the organization dependent upon the virility of the chapters, it appears that the time has now arrived in our development when a stronger financial base should be created at the chapter level.

During periods of good times and high income, it might be wise to establish so-called emergency reserves to protect our chapters against adversity. Funds specifically earmarked for this purpose could be made available under the guidance of the Board of Directors where and when conditions warrant.

The importance of maintaining a close relationship and a feeling of being a part of the national family by the chapters and their membership is paramount. A build-up of the chapter delegate, whereby he is made to feel and recognize his responsibility in the overall picture is one healthy solution and can go a long way towards building unity within the organization.

There can be no question as to the logic of the statement made by one of our Past Presidents, "As the Chapters go, so goes the Society!" The importance of the individual chapters to the general success of the national Society cannot be overemphasized. Therefore, it follows that the more display of energy by the chapters, the bigger the strides The American Society of Tool Engineers can make in reaching its objectives.

Four new members of the Board of Directors are sworn into office by President Waindle, far left They are: Howard C. McMillen, Richard A. Smith, Joseph P. Crosby, and Harold E. Collins.

Directors Gather in Dayton for Semiannual Board Meeting

By Nancy L. Morgan
News Editor

ASTE's budget covering functional and technical activities and projects during the 1953-54 fiscal year totals $370,000, as a result of action taken at the semiannual meeting of the Board of Directors.

Meeting in Dayton, Ohio on October 30 and 31, the national directors approved expenditures for services ranging from technical programs to a tool engineering personnel study, from education awards to activities in the standards field, and all designed to advance the tool engineering profession.

Industrial Executives Named

The Research Fund Committee was expanded to eight members with the election of five more outstanding industrial executives. Named to office were:

Wallace E. Carroll, president of American Gage & Machine Co., Chicago, Ill., and a number of other companies.

Ralph J. Kraut, president of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

W. E. Mahin, technical director, Research Center of Vanadium Corporation of America, Cambridge, Ohio.

Col. Daniel J. Martin, vice president in charge of engineering, Hughes Tool Co., Houston, Tex.

Joseph Sunnen, president of Sunnen Products Co., St. Louis, Mo.

Serving with these members are Roger E. Gay, president of the Bristol Brass Co., Bristol, Conn.; Louis F. Polk, president of the Sheffield Corp., Dayton, Ohio; and Robert Douglas, chairman of the committee, president of Godscroft Industries and Specialloid, Ltd., Montreal, Que. and a past president of ASTE.

They were elected last year, when the Research Fund Committee was established by the ASTE Board of Directors with an appropriation of $75,000 to launch a program of scientific research projects in the fields of manufacturing, manufacturing processes and allied tool engineering subjects. Present plans call for making use of industrial laboratories, colleges and universities throughout the nation for carrying out the research projects. Additional members will be elected, one every

year, until a total of 15 members is reached.

The matter of increasing the number of national directors from 11 to 15, suggested at the 1953 House of Delegates meeting was presented at the Dayton meeting. The Board of Directors discussed the forthcoming referendum vote on the question by the members. Results of this balloting will determine the number of directors to be elected next April at the 1954 annual meeting.

Revised Procedures

Approval was given to the revised procedures drawn up by the National Constitution and By-Laws Committee. Publication of the new procedures, which will have a flexible format so changes can be made easily, is scheduled for early 1954.

The National Education Committee's plans for a carbide workshop to be held during the week of the 1954 Industrial Exposition in Philadelphia were approved by the board. Briefly, the workshop will offer classes on an introduction to carbides, tool fabrication and tool maintenance in the shop, single-point tool application and analysis of results, advanced techniques of turning, milling, etc., and tool wear analysis and typical applications in industry. The necessary instructors and equipment for each class will be provided through the cooperation of carbide corporations and major machine tool companies. A complete printed text, furnished by the participating firms, will be furnished to all who attend the conference.

Two of ASTE's past directors were honored by the board at the semiannual meeting. A special certificate was presented to Retiring Director W. B. McClellan in appreciation of his three years of service as a national director. A special resolution was passed in recognition of Grant S. Wilcox's efforts in the formulation of the accepted definition of tool engineering published in Webster's Dictionaries.

Board members also elected members to serve on the next Annual Nominating Committee, the ASTE group which each year selects candidates for election to the Board of Directors. With Past President L. B. Bellamy as chairman, they are: J. J. Demuth, past president, St. Louis, Mo.; John X. Ryneska, chairman of the National Constitution and By-Laws Committee, Boston, Mass.; Fred J. Schmitt, past director, Chicago, Ill.; and W. A. Thomas, past national secretary, Windsor, Ont., Canada.

The services of ASTE's first parliamentarian were put to use at the semiannual meeting as Past President Ray H. Morris joined board members at their meeting table. His appointment was announced early this fall.

The National Board of Directors is shown as they meet for the first session. Seated in the back at the longer table are: Raymond C. W. Peterson, national secretary; Howard C. McMillen, third vice president; Allan Ray Putnam, assistant executive secretary; Harry E. Conrad, executive secretary; Roger F. Waindle, national president; Joseph P. Crosby, first vice president; Dr. Harry B. Osborn, Jr., second vice president; Harold E. Collins, national treasurer; and Wayne Ewing, assistant secretary-treasurer. Seated at the back of the smaller table are: Richard A. Smith, national director; Willis G. Ehrhardt, national director; and Leslie B. Bellamy, past president and national director. In front are: Gerald A. Rogers, Ben J. Hazewinkel, and George A. Goodwin, all national directors of the American Society of Tool Engineers.

banquet highlights

President Waindle describes the special certificate which was later presented to Retiring Director W. B. McClellan in appreciation of his three years of service as a national director.

The Dayton ASTE chapter, hosts to Society officers and directors for the two-day meeting held at the Dayton-Biltmore Hotel, also arranged an informal membership dinner Friday night in the hotel's junior ballroom. Dayton Chairman R. A. Miller made the introductions. Guests were welcomed by George A. Goodwin, national director of ASTE and a Dayton chapter member. President Roger F. Waindle spoke briefly, paying tribute to the years of service given to ASTE by Director Goodwin. He also cited the presence of six past presidents at the dinner—L. B. Bellamy, J. J. Demuth, Robert Douglas, I. F. Holland, Ray H. Morris, and William Smila.

A program of entertainment was provided by the Dayton members. Strolling musicians played for the reception and a peppy barbershop quartette, "Four Men of Dayton," sang after the dinner.

About 90 persons attended the dinner, including a group of ASTE wives who participated in other activities for ladies earlier in the day. They attended a luncheon at the Rike-Kumler department store and toured the McCall Publishing Co.

Strolling musicians serenade a group of ASTE officers, directors and their wives during dinner.

Director George A. Goodwin reflects a moment in his welcome of Society guests to Dayton. Mrs. Goodwin is seated at the left, Mrs. Waindle is seated on the right.

Third Vice President Howard C. McMillen, second from the left, enjoys a good laugh with Past President Ray H. Morris, far left, and Dayton members and their wives.

At the right are pictured: Mrs. Harry E. Conrad, Executive Secretary Conrad, Mrs. Richard A. Miller, and Dayton Chairman Miller. In the lower photograph, Past President L. B. Bellamy, spearing salad, is seated with a group of prominent ASTE'ers, including William Smila, also a past president, far right.

Nominating Committee Reports on Candidates for Election to Board

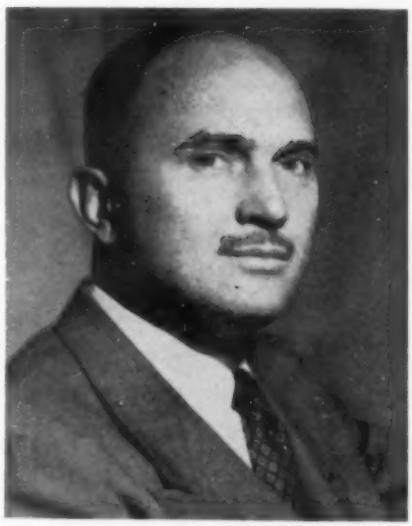
ASTE'S Annual Nominating Committee has selected a slate of 21 candidates for election to the Board of Directors. Voting will take place next April in Philadelphia when the House of Delegates convenes at the annual meeting.

In past years, the number of men elected as national directors has been set at ten, plus the immediate past president of the Society who automatically becomes the eleventh member as indicated in the constitution. However, a petition has been submitted to the National Constitution and By-Laws Committee to increase the membership of the board from 11 to 15. A referendum vote on the question by the members will decide the issue and their wishes will determine whether ten or 14 members will be elected by the 1954 House of Delegates.

Serving on the Annual Nominating Committee were: Past President J. J. Demuth, chairman, Ralph Baker, G. B. Berlien, W. A. Thomas and George P. Torrence. They gave much deliberation and consideration to their selection of candidates. Every chapter was contacted for recommendations of possible candidates and each recommendation was carefully studied.

Their report will be circulated at January chapter meetings so members may give further study to their choices. Chapter representatives to the House of Delegates will be chosen in February.

Additional names can be added to the present list of nominees if 20 or more senior members sign a petition for each proposed candidate. All petitions must be received at national headquarters in Detroit by February 1. For the convenience of TOOL ENGINEER readers, the background of each candidate chosen by the Nominating Committee is presented on the following pages for handy reference.



Roger F. Waindle

INCUMBENT NATIONAL OFFICERS

Roger F. Waindle, now president of the Society and chairman of the Board of Directors, automatically becomes a director from the date of his retirement until the annual meeting in 1955.

Joseph P. Crosby, first vice president and an incumbent national director, is completing his fourth term as a member of ASTE's Board of Directors. He is vice president and sales manager of The Lapointe Machine Tool Co., Hudson, Mass. A senior member since 1941, Mr. Crosby has been chairman of his chapter and headed a number of its committees. He has had wide industrial experience and is a registered professional engineer. A member of other trade and professional groups, he is also active in local civic organizations.

Harry B. Osborn, Jr., second vice president and an incumbent national director, has served three terms as a member of the Board of Directors. He is technical director of Tocco Division, The Ohio Crankshaft Co., Cleveland, O. A past assistant secretary-treasurer of ASTE, he served two terms as chairman of both the National Membership Committee and the National Public Relations Committee. At the chapter level, he has served in numerous capacities culminating in the chapter chairmanship. He has been a senior member since 1943. A national authority in the field of induction heating, he holds a doctorate in chemical and metallurgical engineering, and is a registered professional engineer.

J. P. Crosby

H. B. Osborn

H. C. McMillen

H. E. Collins

R. C. W. Peterson

Wayne Ewing

Howard C. McMillen, third vice president and an incumbent national director, is plant manager at Philco Corp., Bedford, Ind. He has served two terms as national treasurer and three terms as chairman of the National Finance Committee. A senior member since 1939, he is a charter member of the Evansville chapter and served in various capacities culminating in the chapter chairmanship. Mr. McMillen has wide executive experience in the refrigeration industry and is a member of the American Society of Refrigeration Engineers. He holds a bachelor of science degree in mechanical engineering and is a registered professional engineer.

Raymond C. W. Peterson, national secretary of ASTE, is owner of the Peterson Engineering Co., Toledo, O. He served two terms as chairman of the National Standards Committee and was secretary of the B-52 Committee of the American Standards Association. Active in chapter affairs since 1945, he is a past chapter chairman and delegate. Mr. Peterson was instrumental in the establishment of the tool engineering course at the University of Toledo. His affiliations include the Pressed Metals Institute, of which he was a director, the Ohio Society of Professional Engineers and ASME. He holds a bachelor of science degree in mechanical engineering and is a registered professional engineer.

Harold E. Collins, national treasurer and an incumbent national director, is manager of the Process Engineering Department of Hughes Tool Co., Houston, Tex. He is serving his seventh term on the Board of Directors. A charter member and past chairman of the Houston chapter, he became a senior member in 1939 and has been active in chapter affairs. Mr. Collins has served in an advisory capacity to the Joint Industry Mobilization Group of the Machine Tool Industry and is a member of the Tool Committee of the Army Ordnance Association. An industrial executive and tool engineer, he is active in other technical societies.

Wayne Ewing, assistant secretary-treasurer of ASTE, is a partner in the Arrowsmith Tool & Die Co., Los Angeles, Calif. He has served as vice chairman of the National Membership Committee and in most of the Los Angeles chapter offices, including that of the chairmanship. A member of the Society of Automotive Engineers and the Southern California Tool & Die Association, Mr. Ewing has devoted much of his time to several state and county committees for the education of apprentices in tool engineering.

INCUMBENT NATIONAL DIRECTORS

W. G. Ehrhardt is serving his second term on the ASTE Board of Directors. He is managing partner of Ehrhardt Tool and Machine Co., St. Louis, Mo. Past chairman of the National Public Relations Committee, he is also a former member of the National Membership and Program Committees. He became a senior member in 1938 and has held a number of chapter posts, including the chapter chairmanship. Mr. Ehrhardt is past president of the National Tool and Die Manufacturers Association and has had long experience in the tool and die field. A registered professional engineer, he is a member of ASM and also active in other technical and civic organizations.

George A. Goodwin, chief process engineer, The Master Electric Co., Dayton, O., is serving his fourth term as a national director. Former members and past chairman of the National Finance Committee, he was national treasurer for a period of three terms. He is a charter member of the Dayton chapter which he served as first vice chairman and chapter chairman. Mr. Goodwin has held various engineering positions since 1910 and is a registered professional engineer. He is a member of the Advisory Council on Tool Engineering of Sinclair College and is active in a number of professional and civic organizations.

Richard A. Smith is serving his first term as a national director for the Society. He is chief tool engineer at Pratt and Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn. A former member of the Annual Nominating Committee, Mr. Smith is author of Section 12 of the ASTE *Tool Engineers Handbook*. He has been a senior member since 1936 and has served the Hartford chapter in various capacities including that of chapter chairman.

G. A. Goodwin B. J. Hazewinkel W. G. Ehrhardt G. A. Rogers R. A. Smith

Ben J. Hazewinkel, president of Daily Grinding, Inc., South Gate, Calif., is serving his fourth term as a national director. A member of the National Membership Committee for three terms, he was instrumental in the organization of the Denver, Salt Lake City, Los Alamos, Albuquerque, San Gabriel Valley, San Fernando Valley, and Santa Clara Valley chapters. Mr. Hazewinkel has been a senior member since 1942 and has served as Denver's chapter chairman and delegate. He has a broad industrial background in the tool engineering field.

Gerald A. Rogers, a former assistant secretary-treasurer, is serving his second term as a member of the Board of Directors. Sales engineer for Rudel Machinery Co., Ltd., Montreal, Quebec, Canada, he has had wide industrial experience. Mr. Rogers is a former member and past chairman of the National Program Committee and past secretary of the National Membership Committee. He became a senior member in 1942 and has since served the Montreal chapter as program committee chairman, first vice chairman and chapter chairman. He studied industrial engineering at General Motors Institute in Flint, Mich.

Additional Nominees

I. H. Buck

A. B. Clark

A. R. Diamond

H. D. Hiatt

J. O. Horne

H. D. Long

J. L. Petz

L. C. Seager

C. M. Smillie

G. C. Tillotson

Irving H. Buck is president of the Tool Supply & Engineering Co., Dallas, Tex. A senior member since 1942 and a charter member of the North Texas chapter, he is completing his second term on the National Membership Committee. Mr. Buck served in a number of chapter capacities, including three terms as chapter chairman. He is a member of the Dallas Engineers Club, Chamber of Commerce and is active in other civic organizations.

Andrew B. Clark has been technical consultant with Haynes Stellite Co., Division of Union Carbide and Carbon Corp., Cleveland, O., for the past 34 years. He has served successively on the National Public Relations Committee, National Program Committee, and the National Membership Committee which he has headed as chairman for the past three years. Since becoming a senior member in 1939, he has held numerous chapter positions including the chairmanship. Mr. Clark is a former faculty member at the University of Akron, was a teaching specialist for the War Manpower Commission and the War Production Board.

Arthur R. Diamond is vice president of Tools, Inc., Philadelphia, Pa. Now chairman of the National Education Committee, he has been an active member of the committee since 1948. He has held numerous chapter posts and as chapter delegate in 1950 was chairman of the House of Delegates. Mr. Diamond is a member of ASME, serving on the Consultation Committee to ECPD, Society of American Military Engineers, and ASM.

Harold D. Hiatt is supervisor of tool engineering and equipment at Allison Division of General Motors Corp., Indianapolis, Ind. He served as a national director for ASTE from 1935 to 1937 and was a member of the National Education Committee for several years. Two ASTE chapters, Racine and Indianapolis, have elected him to head their officers. Mr. Hiatt has also been active in several chapter committees.

James O. Horne, a senior member of the Rochester chapter since 1940, is owner of the J. O. Horne Co. in Rochester, N. Y. He was a member of the National Program Committee from 1947-1953, serving as committee chairman during 1952-1953. Mr. Horne is past chapter chairman and has held numerous other chapter offices. He is a member of the Rochester Chamber of Commerce.

H. Dale Long, president of Scully Jones & Co., Chicago, Ill., is chairman of the National Finance Committee and has served on the Annual Nominating Committee. In 1952 he was co-host chairman of the Industrial Exposition and chairman of the House of Delegates that same year. Mr. Long has been chairman of the Chicago chapter and held several other chapter offices. He is active in a number of civic organizations. He is a graduate of the University of Illinois.

Joseph L. Petz is partner and owner of the J. L. Petz Co., Poughkeepsie, N. Y. He is completing his fourth term as a member of the National Editorial Committee and is now committee chairman. Active in Mid-Hudson chapter affairs, he has served as chapter chairman and in a number of other capacities. In the field of tool engineering education, Mr. Petz has taught tool design as an outside activity for the past 12 years. He is a member of ASM.

Leslie C. Seager, chief production tool engineer, The Eimco Corp., Salt Lake City, Utah, has been a member of the National Professional Engineering Committee. Active in the formation of the Salt Lake City chapter which he served as chapter chairman, he aided in establishing the tool engineering curriculum at Utah State College. He also promoted the first tool engineering scholarships for the Salt Lake chapter. He is a member of the Institution of Production Engineers in Great Britain.

Charles M. Smillie is president of the C. M. Smillie Co., Detroit, Mich. He is past chairman of the National Professional Engineering Committee and also served two years on the National Membership Committee. A senior member of the Detroit chapter since 1940, he has held various chapter offices including that of chapter chairman. His affiliations include the district chairmanship of the National Screw Machine Products Association. He holds a degree in mechanical engineering and is a registered professional engineer.

George C. Tillotson was supervisor of equipment engineering-planning at Delco Products Div., General Motors Corp., Dayton, O., before being promoted to his present position of engineer with the firm's sales department. A senior member of ASTE, he has held several offices and committee posts in the Dayton chapter including that of chairman. He helped organize the first House of Delegates. Mr. Tillotson served as assistant director and chief of the Program Expediting and Product Distribution Branch in the Metalworking Equipment Division of the National Production Authority during 1952-53. He holds a degree from General Motors Institute and is a registered professional engineer.

Every year one of the most outstanding meetings on Worcester chapter's social calendar is Executives Night. Shown at the head table at the 1953 program are: Roger F. Waindle, national president of ASTE; the Honorable Christian A. Herter, governor of Massachusetts; John E. Rotchford, Worcester chairman; Andrew B. Holstrom, mayor of Worcester; and Joseph P. Crosby, national first vice president.

Massachusetts Governor Herter Addresses Worcester's Annual Executives Night

Worcester, Mass.—One of the biggest meetings of the year, Worcester chapter Executives Night, proved its importance again this year on October 5, when more than 200 turned out for the dinner program held at the Hotel Sheraton. Among the guests attending were national officials of the Society and industrial and governmental representatives. They included Roger F. Waindle, national president of ASTE; Joseph P. Crosby, first vice president; Richard A. Smith, national director; and Harry E. Conrad, executive secretary.

Main speaker for the evening was The Honorable Christian A. Herter, governor of the state of Massachusetts, who spoke on "The Industrial Future of Massachusetts."

Worcester's chapter chairman, John E. Rotchford, welcomed the entire group to the Executives Night. Greetings were extended by The Honorable Andrew B. Holmstrom, mayor of Worcester. Short talks were given by President Waindle and Executive Secretary Conrad.

Other guests at the meeting included: William Arter, Jr., vice president, Arter Grinding Co.; Charles G. Allen, Jr., general manager, Chas. G. Allen Co.; Russell F. Bath, president, John Rath & Co., Inc.; O. S. Buckner, president, Bay State Abrasive Products Co.; Robert M. Chase, plant manager, Telechron, Inc.; M. W. Clement, superintendent of engineering, American Steel & Wire Co.; N. D. Vuyosevich, manager, Hi-Pac Div., Worcester Pressed Steel Co.; Ralph Gow, executive vice president, Norton Co.

Also present were: Harry L. Gustafson, general secretary, Worcester Chamber of Commerce; Richard E. Heald, president, Heald Machine Co.; George F. Holland, president, Union Twist Drill Co.; H. M. Jones, industrial relations manager, Rice Barton Corp.; H. D. Kendall, vice president, Rockwood Sprinkler Co.; Frank D. Lindquist, general superintendent, Crompton & Knowles Loom Works; David J. Milliken, general manager, Lodding Engineering Corp.; Myles Morgan, first vice president, Morgan Construction Co.; George W. Motherwell, vice president, Wyman-Gordon Co.; Lester F. Mulno, chief engineer, Harrington & Richardson Arms Co.

In addition were: Erik O. Pierson, vice president, Whitin Machine Works; Dwight E. Priest, president, Parker Mfg. Co.; A. Bradford Reed, president, Reed Rolled Thread Die Co.; Forrest W. Seymour, associate editor, Worcester Telegram Publishing Co., Inc.; G. K. Simonds, Jr., president, Simonds Saw & Steel Co.; H. W. Thayer, vice president, Draper Corp.; Arthur H. Starrett, president, The L. S. Starrett Co.; Albert J. Gifford, president, Leland-Gifford Co.; and Frederick J. Barry, president, Worcester Taper Pin Co.

—A. H. Shairman

First Annual Social Event Scores Success

Omaha—About eighty members, guests and their wives attended the first Nebraska chapter annual social event at the Happy Hollow Club. A reception hour, dinner, dancing, and entertainment by a local trio were on the program.

—Sam L. Grasso

Joseph P. Crosby Visits Toronto Chapter

Toronto—Joseph P. Crosby, first vice president and national director of ASTE, congratulated the Toronto chapter on its progress during the past few years when he addressed some 100 members and guests during the coffee hour at the October 7 meeting.

Outlining the aims of the Society, Mr. Crosby emphasized the need for an ever-increasing membership and suggested a "no let-up" drive to maintain the progress already achieved.

He gave a resume of coming national events and reported on national membership, THE TOOL ENGINEER, On-Campus Conferences, and educational programs. "The primary purpose of your Society," concluded Mr. Crosby, "is to educate our engineers for the benefit of humanity and for the specific benefit of our countries, yours and mine."

The technical session was highlighted by a talk given by Kenneth N. Macomber, chief service engineer, Lapointe Machine Tool Co., Hudson, Mass. His topic was "Tooling for Jet Propulsion."

—A. McKinney Rice

D. C. Dick

M. I. T. Engineer Addresses Twin States

Claremont, N. H.—Donald C. Dick, Massachusetts Institute of Technology, department of electrical engineering, servomechanisms laboratory, Cambridge, Mass., addressed the October 14 Twin States meeting at Hotel Moody. The title of his talk was "Milling Machine Control by Perforated Tape."

In his talk, Mr. Dick explained what has been done thus far in the field of numerical control, a system capable of automatically generating a large variety of three dimensional work surfaces.

—Maurice E. Blais

Before Kenneth P. Martin addressed the Golden Gate chapter, Dr. George L. Sullivan, dean of the College of Engineering, Santa Clara University, spoke to the ASTE audience. From left: Dean Rowland, Mr. Martin, Dr. Sullivan, Ted Rohrer, John Rotchford, of the National Standards Committee.

Mr. Martin talked to the Tucson chapter on October 13 on his tour of western chapters which was arranged and coordinated by the National Program Committee. Here, Mr. Martin shows one of his many samples of hydroform products to James R. Matthew.

K. P. Martin Featured on First Tour Arranged by National Program Committee

News from eight ASTE News correspondents in western chapters indicates enthusiastic response to the recent speaking tour by K. P. Martin, assistant manager of the Machine Division, Cincinnati Milling Machine Co., Cincinnati, O. The tour was the first one of its kind arranged by ASTE's National Program Committee.

Reporting on Mr. Martin's technical program for the December issue of THE TOOL ENGINEER are: H. E. Anderson, Albuquerque; Philip R. Freeman, Golden Gate; J. J. Smith, Long Beach; H. J. Von Steeg, Los Alamos; Ralph L. Chrissie, Los Angeles; William Keller, San Diego; Glenn Herreman, Santa Clara Valley; and Joseph W. Vincent, Tucson.

On his ASTE tour Mr. Martin spoke to nearly one thousand tool engineers on the new Hydroform equipment. The process is one in which only one half of the usual punch-and-die set is required in forming metals.

The punch is replaced by a flexible diaphragm sealed against high pressure and backed by hydraulic oil. Under exceedingly high pressure this diaphragm pushes against the metal and displaces it to fill the die cavity.

"For short production runs, development work where die changes are necessary, adaptability to different types of metal, and an absence of scoring and marring of the finished surface, the Hydroform is in a class by itself," Mr. Martin said.

Ken Martin receives heartiest thanks from Carl L. Almquist, chairman of the Los Angeles chapter for his talk on "The Hydroform." Martin's talk was heard by a record attendance of 212 members and guests at Scully's Restaurant at the regular October meeting.

Chairman William Lanyon of the Santa Clara Valley examines some sample parts which reveal the merits of hydroforming while Ken Martin explains them. The talk was presented at a dinner meeting on October 20 at the Longbarn Restaurant, Palo Alto.

At the October 16 technical meeting of the Albuquerque ASTE chapter held at the Fez Club, Ken Martin, left, shows H. R. Hanen a number of examples of hydroform technique. Mr. Hanen is chairman of the Albuquerque program committee.

Kessler Talks on Tool and Die Repair at Lima

Lima, Ohio—Sixty-one members and guests of the Lima chapter gathered at the Royal Pine Room on September 15 to hear Frank E. Kessler, engineer from the Welding Equipment & Supply Co., Detroit, Mich., speak on "Tool and Die Welding."

Mr. Kessler preceded his talk with two films entitled "Let's Get the Lowdown" and Let's Do It Right," which depicted the repair of tools and dies by the proper application of welding.

Ray Schimpf introduced eight guests to the assembled group. They were: R. McGranahan, Eric Stover, L. Hillegass, Orville Moffsinger, Fred Heyne, Reece Stanley, Pearl McAdams, and Ed Brenner.

John Rents also introduced the new members who are D. Carpenter, Carol Eugene Grimm, Vernon J. Westerheide, and James E. Wolfe.

The chapter rounded out the month of September with a plant tour of the Monarch Machine Tool Co. in Sidney, Ohio, where some 50 members viewed the Monarch "Moto-Trace," the "Keller Turning Machine," the "Air Gage Tracer," roll-turning lathes, the 60 right-angle lathe, and the "Shapemaster Engraver," in their stages of construction from raw castings and small part storage to the completed machine.

—Donald Cox

B. J. Culbertson Speaks at Racine Meeting

Racine—Some 100 members of the Racine chapter attended the October 5 dinner meeting at Dania Hall. The featured speaker of the evening was B. J. Culbertson, development engineer, Dow Corning Corp., Chicago.

His talk, "How the Tool Engineer Can Use Silicones," covered an explanation of the nature of silicone materials and a discussion of the useful properties of silicone rubber, fluids, greases, resins, and other silicone products. He emphasized new mechanical applications of silicones in his talk. *—Charles P. Nelson*

F. A. Armstrong Retires

After more than 40 years with Pratt & Whitney Division, Niles-Bement-Pond Co., Frank A. Armstrong has retired from the firm as district sales manager of the cutting tool and gage department. A former chairman of the Chicago chapter of ASTE, Mr. Armstrong had covered the Cincinnati, Pittsburgh, St. Paul and Chicago territories.

Clutching Philadelphia scholarship awards are: William Crews, Jr.; Miss Joan Facey; and Robert McGarrigle. Looking over their shoulders are: Campbell Pittsinger, chapter chairman; Arthur R. Diamond, National Education Committee chairman; and Clarence Hamilton.

Plastics Panel Featured at Denver

Denver—The principal speaker at the Denver October meeting was Wayne F. Robb, design engineer, Mycro Tool and Die Co., Denver. His address was confined to his experience of 11 years in the plastics field. A panel discussion was conducted with Mr. Robb as moderator.

A color film was also shown on mining of raw ore through the various stages to a finished product. The movie was made by the Colorado Fuel and Iron Corp. *—James M. Johnson*

Girl Tool Engineer Receives Scholarship

Philadelphia—The Philadelphia chapter has another first. First to enroll a senior woman member, they are now first to award a scholarship to a girl tool engineer.

Miss Joan Facey, a Drexel Institute mechanical engineering student, from Plainfield, N. J., was one of three students to receive a $500 scholarship from the Educational Foundation of the Philadelphia chapter at the fall dinner dance. Festivities took place at the Melrose Country Club near Philadelphia on October 23.

Miss Facey is studying mechanical engineering on the co-op plan. Her time is divided between classes and actual practical application of her knowledge as a junior draftsman at Westinghouse.

Arthur R. Diamond, chairman of the National Education Committee and president of the educational foundation, assisted by Clarence Hamilton, executive secretary of the Sheffield Foundation, made the awards. Recipients were Miss Facey; Robert McGarrigle, University of Pennsylvania student from Philadelphia; and William Crews, Jr., Villanova student from Staten Island, N. Y. *—C. R. Pittsinger*

Appointed Vice President

R. J. Minshall, president of Pesco Products Div., Borg-Warner Corp., Cleveland, O., has announced the appointment of P. W. Brannon as vice president of manufacturing. A member of the Cleveland ASTE chapter, Mr. Brannon has been with the firm since 1952 as manager of manufacturing.

Frank Zagar, right, vice president of Zagar Tool, Inc., spoke to the Fort Wayne chapter on "Jig Design and Operational Technique" at the October meeting. The use of guide pins was explained in relation to multiple spindle drilling by color slides of drill heads. Pictured with Mr. Zagar is Blaine I. Garard, first vice chairman of the Fort Wayne chapter. ***—Richard Spaw***

Five engineers from Germany were guests of the Society in October for a one-day meeting to study non-cutting metal forming with ASTE's staff. The visit was sponsored by the Foreign Operations Administration, Washington, D. C. Participating in the discussions for ASTE were: F. J. Sehn, chairman of the National Book Committee; Allan Ray Putnam, assistant executive secretary; John Greve, editor of *The Tool Engineer* magazine; Phillip Harvey, assistant technical director; and John M. Holt, Jr., assistant handbook editor.

Tri-Chapter Meeting Draws 200

Baltimore—An attendance of more than 200 members, including national officers of the Society, highlighted the tri-chapter meeting arranged by Baltimore, Greater Lancaster and Central Pennsylvania ASTE members. The all day program was held October 3. It featured a tour of the Sparrow Point plant of Bethlehem Steel Co. and a banquet at Munder's Lauraville House.

Special guests at the meeting were: Roger F. Waindle, national president of ASTE; Thomas J. Donovan, Jr., past national director; and Harry E. Conrad, executive secretary of the Society.

Mr. Waindle gave a short talk on the advantages of ASTE membership, emphasizing the recognition being received by the Society. Mr. Donovan related a few of his many experiences in working in ASTE. In his talk Mr. Conrad discussed the growth of ASTE and reported on the progress of the 1954 Industrial Exposition. Banquet introductions were made by Don Wernz, chairman of the Baltimore chapter.

On the Bethlehem tour every phase in the manufacture of steel was viewed. Luncheon was served to the 200 visitors in the company's executive dining rooms. —*C. G. Kelley*

Association Executives Visit ASTE Headquarters

Purposes and services of a large American technical society were described to a group of European, South American and Far East trade association executives October 8, by officials of the American Society of Tool Engineers. The group came to Detroit to visit the national headquarters of the Society at 10700 Puritan Ave. under the auspices of the Mutual Security Agency.

Trade association executives from Austria, Belgium, Denmark, Italy, Sweden, Turkey, Formosa, Indo-China, the Philippines, Chile and Mexico were visiting the United States for a five-week study of American technical and trade association work.

Harry E. Conrad, ASTE executive secretary; Allan Ray Putnam, assistant executive secretary; and John Greve, editor of THE TOOL ENGINEER; led the discussions. Excerpts from the two-day Leadership Conference, held in Detroit last March, were used for the presentation.

Practical Foundry Work Topic of Keene Talk

Keene co-chapter, affiliate of Twin States, held its October 22 meeting at Kingsbury Machine Tool Corp. L. R. Spaulding, president of Spaulding Metal Works, Nashua, N. H., was the speaker. His topic was "Practical Foundry Work." Mr. Spaulding stressed the need of close cooperation between the engineer and the pattern maker to the audience of 71. —*D. J. Brown*

President Roger F. Waindle emphasizes an important point in his talk before the Baltimore, Greater Lancaster and Central Pennsylvania chapters, as Executive Secretary Harry E. Conrad, left, re-lights his pipe.

Thomas J. Donovan, Jr., who is a past director of the Society, was also a guest at the tri-chapter meeting.

Long Island Holds First Dinner Dance

Long Island—The first dinner dance ever staged by the Long Island ASTE chapter was held October 24 at the Garden City Hotel. More than 150 persons were on hand to make the event a successful one. Dinner and dancing were the featured attractions. Arrangements were made by Don Griffing, John Hatter and Sheldon Meyers in cooperation with the plant representatives.

On October 12 a technical program on heat-treating practices as applied to ferrous metals drew an attendance of 65 members and guests. Speaker for the program was James McElgin, metallurgist with the E. F. Houghton & Co., Philadelphia, Pa.

Mr. McElgin described briefly the following phases: tempering, case hardening, selective hardening, stress annealing and quenching. He discussed at length the proper and improper use of air, gas, salt and mineral oil baths.

At the first meeting of the student section of the Long Island chapter, 50 members heard a program presented by Robert Kipping of Grumman Aircraft; Richard Wolynies of Fairchild Camera and Instrument Co.; and Richard Luhman of Fairchild Guided Missile Co.; all former members of the group. Elected to office at the meeting were John Oliver, vice chairman; and Werner Newman, secretary.

—Sara T. Moxley

W. B. McClellan Visits Saginaw Valley Chapter

Frankenmuth, Mich.—The Saginaw Valley chapter attended the October 15 meeting at the Zhenders Hotel 166 strong. W. B. McClellan, national director of ASTE, was a special guest and offered a few remarks of general interest on long-run national policies.

The technical session featured two speakers, Prof. William Gilbert of the University of Michigan Engineering School, Ann Arbor, spoke on "Tests with large Relief Angles—12, 15 and 18 Degrees," reviewing the test conducted under his supervision at the university machine laboratory.

Also on the program was Kenneth R. Blake, president of Metalloid Corp., Huntington, Ind., who spoke on "Dynatomics," a new concept of metal-cutting involving radical changes in tool angles and "coolants."

A panel discussion followed with Clyde Fanning of General Motors Institute, and Mr. Blake giving their views and answering questions.

—Kent B. Arnold

Peoria's technical speaker, R. S. Hildreth, second from left, answers a question for Clarence Tohn far left, H. Pelphrey and O. Gammon at the October meeting.

Gear Cutting Topic for Peoria Program

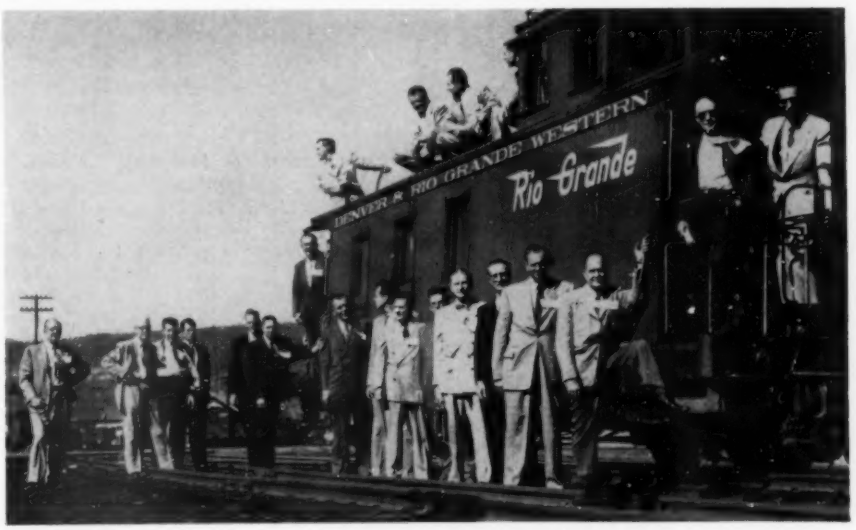
Peoria, Ill.—Design factors often result in some strange looking gears and it's up to the tool engineer to figure out how they may be cut, Richard S. Hildreth, field engineer, Michigan Tool Co., Detroit, told the Peoria chapter of the American Society of Tool Engineers at the October meeting. What the production man needs to know are the various gear cutting methods available to him to get the job done and the advantages as well as the limitations of each.

Although hobbing machines are well-known in all gear cutting establishments, Mr. Hildreth told his 200 listeners, a recent development in the field is a high-speed hobbing machine that can spin the spindle at 1000 rpm. This speed is brought about by the realization that high-speed steel hob life is surprisingly good at higher rates of surface speed.

To get the required accuracy out of a hobbing machine, it must be maintained in excellent repair, the gear blank must be accurate and the material being cut should be consistent metallurgically.

Clarence Tohn was technical chairman for the evening. New members of the past month are: Gary Claudin, Raymond Glenn, James Howell, Arthur Rose, Emanuel Bair, Harold Dingerson, Judson Lindsey and Leo Smith.

—Russ Saurs



A visit to the Denver & Rio Grande Western Railroad was one of the highlights of the annual conference of inter-mountain ASTE chapters held this fall at Durango, Colo. Representatives from Salt Lake City, Albuquerque, Tucson, Los Alamos, Phoenix and Denver met to discuss chapter problems, exchange ideas and plan future activities. Dr. Frederick Preator of Salt Lake City acted as general chairman. Ben Hazewinkel, a national director of the Society, was an honored guest at the conference. ***—James F. Johnson, H. S. Von Steeg***

Plant Tour Highlights Cincinnati Activities

Norwood, Ohio—The Cincinnati chapter toured the Cleveland Automatic Machine Co. in Norwood, Ohio on October 13. The tour was planned through the efforts of Program Chairman Joseph C. Maezer, with the help of James L. Schultz, Charles F. Schweiter, Lauren C. Le Roy, and Omar C. Bruce.

Upon arrival at the plant, the visitors were divided into smaller groups and assigned to guides who could explain the phases of the work which would most interest tool engineers. The groups saw storage facilities, the fabrication and sheet metal shop, sales departments, engineering departments, the main machining shop and the assembly department.

Nicholas Peay, vice president of the company, welcomed the group at coffee hour. —*Louis H. Schumann*

Patent Counselor Addresses New Orleans

New Orleans—Attorney Robert Harris, assistant patent counselor, Chrysler Corp., presented a talk entitled "Patent Law and its Interest to Engineers" at the regular monthly meeting of the New Orleans chapter held at Tulane University on October 14.

Robert Harris

Two colored movies were also shown on "The Safe Use of Firearms While Hunting" and "Training Bird Dogs and Retrievers."

On October 17, the chapter held its annual outing at Twin Oaks picnic grounds. An enjoyable day was reported by all those in attendance.

—*P. A. Young, Jr.*

Officers surround L. D. Richardson, center, guest speaker and divisional sales manager, Eutectic Welding Alloys Corp. who spoke on "Salvage and Repair of Dies" at the Toledo September meeting held at the Maumee River Yacht Club. From left: Walter Toepfer, second vice chairman; Joe Kertz, chairman; Mr. Richardson; Lewis C. Pascoe, treasurer; and Allan G. Warren, chairman of the program committee.

Positions Available

SALESMEN WANTED—Can you sell taps and drills? We are looking for experienced shop-trained salesmen or sales organizations able to sell high-speed taps and drills to the user. These tools, both standard and special, meet the exacting requirements of the production user. The man or men we seek must be able to sell a quality product, must have the ability to make sales on the basis of superior service provided by our engineering and manufacturing division.
Our own service engineer works with you to develop the major tap and drill accounts. We would prefer an established organization that has approved record of sales in the cutting tool field, but will select men or organizations able to convince us that they have the ability, integrity, and persistence to produce profitable sales for themselves and this company. Write to Besley-Welles Corp., Beloit, Wis.

TOOL & METHODS ENGINEERS—Long established company in small Missouri town is expanding operations. Needs two *experienced* tool and methods engineers, one in machine tools and machining, particularly brass and bronze; one in metals fabrication, punch press, forging, welding, galvanizing. Both will design tools, dies, jigs, fixtures, make methods surveys, estimate costs, determine manufacturing processes, prepare layouts, etc.
Company in 47th year, not a war baby, but good, substantial jobs with a future. Salary, group insurance, paid vacations, sick leave, profit sharing retirement plan. Pleasant living and working conditions away from city traffic congestion. Good schools. If you are interested and have the *experience*, write details to Box 040, The Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich. Confidential.

TRAVELLING SALES REPRESENTATIVE
Thoroughly familiar with diamond-tools and wheels and their respective uses, wanted by progressive reputable company in Westchester County, N. Y.; must be able to deal with technical abrasive problems. Overriding commissions on established distributors' accounts throughout the country, travel expenses, plus bonus arrangement. Replies confidential. Write Box 010, Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich.

Positions Wanted

NEW ENGLAND REPRESENTATION—Are you desirous of additional sales coverage? Thorough service can be offered in the New England area by aggressive young mechanical sales engineers. Newly formed company; over 15 years of contacts established with the aircraft, electronic and metalworking industry. Write to Box 060, The Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich.

MACHINE AND TOOL DESIGNER—with over 25 years' experience with machine tools by leading American, Canadian, and European machine tool companies wants machine or tool design work in his spare time. Living in Buffalo, N. Y. Write to Box 030, The Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich.

TOOL DESIGNER—with 13 years' experience seeks work in Southwest—Arizona, Texas or other state in this area. Worked with Dana Corp., Aro Equipment Corp., and Capehart-Farnsworth. Am now living in Fort Wayne, Ind., but chronic sinus infection demands a permanent change of climate. Write Box 020, The Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich.

Northern New Jersey Reports 50 New Members

Heat Treating Forum Highlights Calendar

Pittsburgh—The Pittsburgh chapter devoted its October 2 meeting to a heat-treating forum at the Sheraton Hotel. It was conducted by the Pittsburgh Commercial Heat Treating Co. More than 100 members and guests sat in on the session.

Five men comprised the panel. Elmer J. Cox gave the introduction and general outline. Clifford L. Amend spoke on "Heat Treating of Tool and Dies," Ralph Lovejoy followed with "Flame Hardening," Marshall E. Ramsey presented "Heat Treatment of SAE and AISI Steels," and G. Robert Cox addressed the group on "Brazing of Composite Dies." A provocative question period followed.

On September 28, the chapter held its annual golf party at Churchill Valley Country Club. More than 300 members and guests of the chapter were on hand. After a full day of 18-hole golf, the group gathered in the club house for buffet style dinner and an entertaining demonstration by Cy Hungerford, cartoonist for the Pittsburgh Post Gazette. He drew many cartoons of prominent individuals and current events. —*E. L. Caughey*

Diamond Lapping Topic at Williamsport

Williamsport, Pa.—The regular monthly meeting of the Williamsport chapter took place at the Angler's Club on October 12. Joseph M. Throckmorton, assistant sales manager, Hyprez Division, Engis Equipment Co., Chicago, was the speaker. His subject was "Super-Micro Finishing of Metals by Diamond Lapping." In his talk Mr. Throckmorton explained and demonstrated the purpose and application of diamond lapping under actual conditions. —*John L. Balint*

Dayton Chapter Tours Auto-Lite Company

Dayton—The October 12 meeting of the Dayton chapter was highlighted by a trip to Cincinnati to view processes at Electric Auto-Lite Co. A dinner stop was made in Lebanon, Ohio, at the historic "Golden Lamb," Ohio's oldest hotel.

Seventy-five attended the September meeting at Suttmiller's Restaurant, which featured a program of slides on hydraulic equipment manufactured by Denison Engineering Co., Columbus.
—*W. J. Killinger*

The first graduates of the die design course sponsored by the Windsor chapter receive their diplomas. The course is tutored by qualified chapter members. Left to right: C. B. Moncrief, chairman of the educational committee; Harry Atherton, Ronald Hanson, graduates; David C. Heath, immediate past chairman; and Claude Marquis, another graduate. —*E. W. Harris*

Rochester chapter toured the Bausch & Lomb Optical Co. on October 12. Shown are: Jerry Sick, first vice chairman; L. B. McKinley, vice president in charge of scientific instrument sales; E. Koch, production superintendent of sales; Donald Koehler, chapter chairman; William Auer, tool engineer; and Glen Lewis, assistant administrator of process deevlopment at the company. —*Paul Bruno*

Members of the Madison chapter invited neighboring chapter, Milwaukee, to join them in a tour of the Gisholt Machine Co., Fond du Lac, Wis. A dinner and technical session followed at the Nakoma Country Club with J. W. Oliver, Detroit district manager, Besley-Wells Corp. the main speaker. —*A. J. Mergen*

Richardson Gives Ideas

Northern New Jersey Reports 50 New Members

The Northern New Jersey chapter reports gratifying results from a membership drive started last May under the leadership of Robert Reade, Jr., their membership committee chairman.

With the addition of some 50 new members since the start of the drive, the roster now has well in excess of 500 names. On the list are invited members from Turkey, India and Brazil.

The chapter began its season on September 8 with a technical session featuring a talk by L. C. Fish of Hyatt Bearings Division, General Motors Corp., Harrison, N. J. Mr. Fisk spoke on "Fundamentals of Anti-Friction Bearings." —*Anthony Cuoco*

Research Engineer Gives Metal-Cutting Talk

Milwaukee—J. R. Roubik addressed the Milwaukee chapter on October 8 at the American Serb Hall on the basic requirements of metal-cutting. Mr. Roubik is a research engineer at Kearney & Trecker Corp., Milwaukee.

He discussed cutting speeds, feeds, tool angle and lubricants, and summarized the results of some laboratory tests for the design of better machine tools, fixtures and cutters. The talk was illustrated with 35 mm slides on production problems and experimental data on carbide milling.

Dr. A. O. Schmidt, chief research engineer at Kearney & Trecker Corp., was on hand in discussion session.

After dinner entertainment included a technicolor film entitled "The River Beyond" through the courtesy of the Peerless Electric Co. of Milwaukee.

—*Walter Behrend*

Pictured at the October dinner meeting of Lehigh Valley chapter are: Bruce Shaller, program chairman; John D. Folwell, chairman; Speaker Frank Martindell, consultant on machine design and tooling, Design Service Co.; Werner, O. Miller, first vice chairman; and Vincent Scalese, secretary.

Rockford Chapter Again Plans Student Contests

Rockford, Ill.—Rockford East and West High School mechanical drawing instructors were guests of the Rockford educational committee members at the Lafayette Hotel on October 28. The purpose of the meeting was to plan and discuss contests for high school students. Six of the instructors were presented with *Tool Engineers Handbooks* by the committee in appreciation of assistance in carrying out the committee's program.

Arrangements were made for a contest among the high school students in mechanical drawing classes. The contest will be judged on the basis of best class work and improvement.

The second semester contest will be held to encourage original thought and design by the students. They will be offered either of two problems; the redesigning of a milling cutter to increase the amount of blade available for use, or the redesigning of a universal joint to increase the available angular movement.

The educational committee is also considering extending its program to include Illinois Tech extension at Rockford College. —*Kenneth Hull*

Martindell Addresses Lehigh Valley Chapter

Allentown, Pa.—A dinner meeting was on the calendar for Lehigh Valley chapter on October 16 at Hotel Traylor. The featured speaker was Frank Martindell, consultant on machine design and tooling, Design Service Co., New York, N. Y. Mr. Martindell is a past national director of ASTE, and has served on the National Handbook Editorial and Educational Committees. He is also past chairman of the Chicago chapter.

The topic of his talk was "Critical Appraisal of Assembly Methods." Particular emphasis was placed on cost reduction by simplification of assembly methods, the increase of lot sizes to justify the cost of tooling, and the elimination of hand operations and a continuous straight-line flow with proper jigs and fixtures.

—*George W. Savitz*

Rockford chapter members traveled by auto to the Parker Pen Co., Janesville, Wis., for a plant tour on October 23. A group is shown here examining production means used at the plant. William Moreland, chapter chairman, gave a short talk on future ASTE activities.

Indianapolis Hears Talk on Vacuum Usage

Indianapolis — "Industrial Vacuum Usage" was the title of the talk given by Lorence E. Sterns, chief engineer of Whittington Pump and Engineering Corp., Indianapolis, on October 5. He was assisted in his presentation by Richard Whittington, president of the corporation. A number of slides on industrial vacuum usage supplemented the talk.

On October 20, the Indianapolis chapter had its annual fall free bean supper at Liederkranz Hall. The custom was started seven years ago as a fellowship program.

—*M. B. Rosenbarger*

Hartford Members View

Fond du Lac Holds

Richardson Gives Ideas for Reducing Tool Cost

Welland, Ont.—The Barclay Hotel was the scene of the October 1 meeting of Niagara District chapter. Featured speaker was L. D. Richardson, sales engineer, Eutectic Welding Alloy Corp., Flushing, N.Y. He is also consultant with the Atomic Energy Welding Commission.

His talk on the modern-day toolroom encompanssed cost reduction by reclaiming expensive tools and tool cutters. His solution was welding.

—William A. Yaeger

Houston Records Largest Attendance in History

Houston—The Ben Milam Hotel was the scene of the Houston October 13 meeting at which 238 members and guests were present, the largest such attendance record in the chapter's history.

J. C. Hebert, general sales manager, Jones & Lamson Machine Co., Springfield, Vt., gave the technical talk "High Velocity Turning with Tungsten Carbides." Mr. Hebert supplemented his talk with slides and a full-color 16-mm movie.

The following members were presented with ASTE emblem cigarette lighters for obtaining three new members each: Joe Willson, Tex Perry, Dean Saurenman, Harry Betts and Roy O'Brien. The presentations were made by Ernie Rees, co-chairman of the membership committee.

—M. M. Wiseman

A group of London St. Thomas chapter members watch the skill of their fellow team mate as he tries for a dead ringer in a horse shoe game. The game was one of the many which enhanced their annual field day.

Positions Available

TOOL AND MACHINE DESIGNERS—

One of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 8120 Blue Ash Ave., Cincinnati 36, Ohio.

Canadian Chapter Hears Electronics Talk

London, Ont.—The London-St. Thomas chapter held its regular monthly meeting at the Cobblestone Inn in London, Ont. on October 15. R. H. Foy of Canadian Westinghouse Co. was guest speaker. His talk was entitled "Electronics at Work."

Mr. Foy traced electronics through the fields of business, medicine, industry and defense. Of particular interest to the members was his explanation of a basic radar device, similar to the "block system" now employed on the railroads. This system would enable planes to be aware of the position of others at a large airport. It is hoped this equipment will prevent many accidents.

On September 12 the chapter held its second annual field day at Dreamland in Dorchester. Some 75 members and friends participated in golf driving, horseshoe pitching, dart games and socket ball.

Refreshments were under the supervision of Al Trueman and Len Allingham. Bill Hutchinson and Ron McLeod won the golf-driving and golf-putting contests, respectively. The horseshoe contest was won by the team of Ron McLeod and Ross Dilling, while the socket ball contest was taken by Lloyd Levy and Len Allingham.

Other prizes were awarded to Jerry Lewis, Reginald Moore, Jeffrey Symons, Lewis Ballantyne, Al Trueman, John Palkovic, Lloyd Levy, H. Hathaway, Vic Stilwell, Howard Wright, William Hutchinson, William Weames, and Thomas Pherigo. *—F. W. Lewis*

Jack Duncan is being presented a *Tool Engineers Handbook* by Frank Flannery, chairman of the Akron chapter, and by Morris McPhetridge, the chairman of the educational committee. Mr. Duncan was chosen as the most outstanding student of engineering at Akron University. Left to right: Mr. McPhetridge, Mr. Duncan, and Mr. Flannery.

Lou Slager Visits

Hartford Members View High-Speed Photography

Hartford—Members of the Hartford chapter convened at the City Club for their first regular meeting of the season on October 5. Dinner and a coffee speaker were on the agenda. Charles Avedisian, director of physical education from the city of New Britain, Conn., gave an entertaining talk on his exploits in professional football with the New York Giants.

The technical session held forth at the Hartford Gas Co. after dinner. The subject under discussion was "High-Speed Photography, Industries' New Tool." A number of speakers presented different phases of the concept. M. L. Sandell gave a brief talk and showed the film "What High-Speed Photography Means in Time." Henry Kragiel of Stanley Works Laboratory revealed design improvements through another talk and three films.

Mr. LaPointe and Mr. Berg of the Royal Typewriter Co. showed films on mechanical applications of high-speed photography on their electric typewriter.

Mr. Montano and Mr. Moss of Hamilton-Standard Division of Pratt & Whitney Co. showed a color film of high-speed photography of the action of propellor blade striking the water on an amphibious plane.

—A. Douglas Proctor

Evansville Tours Bucyrus-Erie Plant

Evansville—Some 80 members and guests of the Erie chapter met at Hadi Shrine Temple on October 12 for the regular monthly meeting.

Featured speaker of the evening, James Jordan, supervisor of industrial relations, The Bucyrus-Erie Co., Evansville, arranged a tour of the Bucyrus-Erie plant after the meeting.

The group viewed the whole plant including forge shop, machine shop welding department, and final assembly.

—Guenther F. Wulf

Mils Haglund Addresses Richmond ASTE Group

Richmond, Ind.—Some 70 members of the Richmond chapter convened at the Le Land Hotel on October 13 to hear Mils Haglund of Haglund Engineering and Mfg. Co., who aired his ideas on contour grinding. His talk encompassed the methods and history of profile grinding, and was aptly illustrated by drawings on the blackboard.

—Elbert Hale

H. N. Staats, pictured here, was one of the technical speakers at Fox River Valley chapter's October dinner meeting held at the Baker Hotel. He gave a demonstration of his "psuedo brain machine" shown at the right. The presentation was witnessed by 75 members and guests of the chapter.

Anthony Zamis Talks on Gear Tooth Design

Joliet, Ill.—The Louis Joliet chapter held its monthly dinner meeting on October 20 in the main hall of the Veterans of Foreign Wars Post. Some 120 members attended the meeting.

Special guests included Verne Loeppert, National Membership Committee member; Glen Whitney, city editor of the Joliet Herald News; Anthony Zamis, technical speaker of the evening, of Illinois Tool Works, Chicago; and John Sheckler, also of the Illinois Tool Works.

Mr. Zamis's address was "Gear Tooth Design Cause and Effect." A high level discussion period followed during which Mr. Zamis answered a number of interesting questions. *—H. E. Freier*

Fond du Lac Holds Past Chairmen's Night

Kaukauna, Wis.—Members from Kaukauna, under the cochairmanship of A. W. Mayer and G. E. West, sponsored a monthly dinner meeting of the Fond du Lac chapter at the Elks Club in Kaukauna, Wis. The occasion was also "Past Chairmen's Night" and six past chairmen were on hand for the event. Present were: William Felton of Sheboygan; Gideon Kane of Green Bay; L. J. Kaufman of Manitowoc; Jule Schommer of DePere; Allen L. Mckay of Kaukauna; and William H. Jorgensen of Green Bay.

George West of Kaukauna, just recently returned from Europe, where he attended the "European Machine Tool Exhibition" at Brussels, Belgium, gave a short report on the Exhibition, itself, at well as his views on European machine tool industry. He visited machine tool manufacturing plants in England, France, Germany and Switzerland.

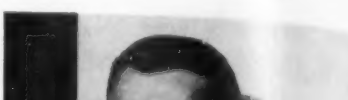
The speaker for the evening was V. A. McChesney, sales engineer and industrial consultant of the Detroit office of Kaiser Aluminum & Chemical Corp. His subject was "Deep Drawing Aluminum." *—Robert M. Hanson*

Portland Hears Shell Representative

Portland, Me.—The Portland chapter held its regular monthly session at the Columbia Hotel on October 9. Featured speaker for the evening was E. L. H. Bastian, senior engineer for the Shell Oil Co., New York. Mr. Bastian gave an illustrated lecture on the service characteristics of fluids to specific operating conditions on both water and oil soluble types used for drilling and cutting operations. *—Henry C. Hagman*

ASTE's second vice president, H. B. Osborn, Jr. is also chairman of his chapter's scholarship committee in Cleveland. At the meeting held to determine the winner of the group's $500 award, photographed by Dr. Osborn, are shown: Miss Bertha L. Wellman, industrial editor of the *Cleveland Press*; Warren H. Chase, vice president of Ohio Bell Telephone Co.; Miss Mildred Hickman, director of vocational guidance at Cleveland Public Schools; W. E. Benninghoff, vice president of the Ohio Crankshaft Co.; and Charles Sutherland, vice president of Reliance Electric & Engineering Co.

Coming MEETINGS



Lou Slager Visits Springfield Chapter

Springfield, Ill.—Special guest at the October 6 meeting of the Springfield, Ill. chapter was Lou Slager, member of the National Membership Committee. The meeting was held at "The Mill" and 65 members and guests were present.

Mr. Slager gave a brief talk on the importance of building up the national membership. The technical talk was delivered by S. A. Brandenburg, vice president in charge of sales, The Monarch Machine Tool Co., Sidney, Ohio.

Mr. Slager's talk, "Latest Developments in the Turning Field," dealt mainly with a new lathe which has been developed with pneumatic-hydraulic controls and a template and follower device to produce complex shaped parts by the use of only one single point tool.

—Charles Collier

Modern Gaging Topic of Binghamton Talk

Binghamton, N.Y.—A successful meeting night was reported by the Binghamton chapter which gathered at the Vestal American Legion Hall on October 7.

Speaker for the evening was Edward Pearne, of the DoAll Co., Des Plaines, Ill. His subject was "The Science of Precision Measurement." Mr. Pearne's talk included the principles, techniques, and equipment used in modern gaging and an interpretation of the nationally and internationally agreed upon linear standard of measurement and light wave lengths.

—Charles L. King

A. O. Schmidt Principal Speaker at Piedmont

Charlotte, N.C.—A number of faculty and student representatives of vocational schools in and around Charlotte were guests of the Piedmont chapter when they held their regular monthly meeting at Hotel Mecklenburg October 12.

The technical speaker was A. O. Schmidt, chief of metal-cutting research, Kearney & Trecker Corp., Milwaukee. The title of his talk was "Modern Metal-Cutting Principles and Applications." In his talk he emphasized the necessity of good grinding machines and techniques to obtain the best milling machine and cutter performance.

—Henry H. Palmer

One of the first photographs taken of the Muskegon chapter is this picture showing members of the executive committee. From left: Paul Hornak, Jr., public relations; Ervin A. Byro, editorial; H. I. Steinman, program; Vernon I. Nephew, membership; Jay Retsema, education; John R. Baker, professional engineering; James Swineheart, standards; and Sidney Seiferlein, constitution.

—Ervin A. Byro

Aluminum Processes Discussed at Cleveland

Cleveland—The regular monthly meeting of the Cleveland chapter was held on October 9 at the Carter Hotel. Approximately 75 members and guests were on hand.

The principal speaker was John A. Lengbridge, project engineer, Aluminum Goods, Ltd., Toronto. His address was entitled "An Evaluation of Drawing vs. Spinning as Applied to Aluminum." Accompanying the talk was a variety of parts that were spun, drawn, or a combination of both processes.

The coffee speaker, S. E. Flenner, sales manager, Alloy Precision Castings Co., Cleveland, presented a talk on "Mercast Process of Frozen Mercury Castings." He illustrated his speech with three dimensional slides.

—R. C. Carmichael

Die Casting Discussed at Rockford Meeting

Rockford, Ill.—Approximately 120 members and guests of the Rockford chapter gathered at the Lafayette Hotel on October 8 for a dinner meeting.

Featured speaker for the evening was Austin Lillegren, vice president in charge of sales, Madison-Kipp Corp., Madison, Wis., who spoke on "Die Design for Die Casting." A large number of samples of die castings were exhibited by Mr. Lillegren.

Coffee speaker was Louis Caster, president of Keig-Stevens Baking Co. of Rockford. He gave a brief talk of local interest on "The Memorial Coliseum," a civic project under current consideration.

Special guests included Donald Lillegren, son of the main speaker, also representing Madison-Kipp, and Everett Anderson, president of Globe Imperial Corp., Rockford.

—Kenneth Hull

Tri-Cities Chapter Hears Walter E. Rollins

Tri-Cities chapter members heard Walter E. Rollins, assistant in charge of screw machine tooling, Brown & Sharpe Mfg. Co., Providence, R. I., at their October meeting. Mr. Rollins' lecture was illustrated by two films, "The No. Four Screw Machine" and "Interesting Tooling Applications on the No. Four Automatic." Special guests attending were: I. E. McLaren, manager of the Brown & Sharpe Chicago office, and Dean Williams, Davenport representative for the company.

—Earl Tenpound

Verson Executive Talk at Lancaster

Lancaster, Pa.—The Greater Lancaster chapter chose as its October 13 meeting place the Campus Room at Franklin and Marshall College in Lancaster.

Melvin D. Verson, executive assistant, Verson Allsteel Press Co., presented the technical portion of the session. Mr. Verson showed two color-sound films entitled "Transmat Presses and Tooling" and "Manufacture of the Maytag Automatic Washer."

Arrangements for the program were made by J. A. Carlin, Jr., of J. A. Carlin Co., Inc., Bala-Cynwyd, Pa., distributors of Verson equipment and other machine tools.

—George J. Coil

Attorney Addresses Erie Dinner Meeting

Erie, Pa.—The monthly dinner meeting of Erie chapter at Pulakos-on-the Lake on October 6 featured a talk by James G. Hanes, attorney and member of Gannon College faculty, Erie. He summed up state and Federal laws concerning wills and estates.

—H. W. Sedler

Author Presents Views on the Cutting Edge

Boston Chapter Holds Annual Executive Night

Coming MEETINGS

BUFFALO-NIAGARA FRONTIER—Dec. 19. Christmas party.

CEDAR RAPIDS—Dec. 9. "The Use of Wax Lubricants for Bending, Forming and Drawing Operations" by E. A. King, district manager, S. C. Johnson and Son, Inc., Racine, Wis.

CHICAGO—Dec. 7, 6:30 p.m., Keyman's Club. "Hopper Feed and Their Applications and Adaptations" by Robert Gladfelter, general sales manager, Detroit Power Screwdriver Co.; David Houch, application engineer, Syntron Co.; and W. C. Denison, president, Denison Hydraulic Press Co.

CINCINNATI—Dec. 8, 8:00 p.m., Engineering Society Headquarters. "The Use of Wax in Cutting Compounds and Drawing Lubricants" by J. A. Werner, S. C. Johnson & Son Co., Racine, Wis.

CLEVELAND—Dec. 12. Annual Christmas party.

DETROIT — Dec. 10, Latin Quarter. Christmas party. Attendance limited to 715. Doors open at 6, dinner at 7:15 p.m. Gifts for everyone.

FAIRFIELD COUNTY—Combined meeting with the Bridgeport Tool Engineers. Joint Christmas party.

FOND DU LAC—Dec. 11, 6:30 p.m., Oshkosh. "Metalworking Press Equipment" by John R. McCutchen, Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

FORT WAYNE—Dec. 9, 6:45 p.m., Chamber of Commerce. "Speedgrip Chuck" by F. I. Ernest, Division of Ernest, Holdeman & Collet, Inc., Elkhart, Ind.

FOX RIVER VALLEY—Dec. 5, 7:00 p.m., Baker Hotel, St. Charles, Ill. Christmas party and Ladies' Night. J. H. Babcock, emcee, manufacturing engineer, Barber Greene Co., Aurora, Ill.

GREATER LANCASTER—Dec. 1, 6:45 p.m., Brunswick Hotel. Ladies' Night. Du Pont Co. will put on a program of interest to the ladies.

GRAND RIVER VALLEY—Dec. 4, Moffat's Hall, Galt, Ont. Representative from Cutter Grinding Norton Co., Hamilton.

GOLDEN GATE—Dec. 4, Colombo Club. Annual Christmas party.

HOUSTON—Dec. 11, 6:30 p.m., Golfcrest Country Club. Annual Christmas dance and Ladies Night.

LIMA—Dec. 12, Royal Pine Room, Lima. Ladies' Night.

LITTLE RHODY—Dec. 5, Providence. Christmas party.

MILWAUKEE—Dec. 10, 8:00 p.m., American Serb Memorial Hall. "Coated Abrasives Used in Industry" by W. A. Corse, assistant manager of sales engineering, Coated Products Division, Carborundum Co., Niagara Falls, N. Y.

NIAGARA DISTRICT—Dec. 3. "Applied Hydraulics in Industrial Application" by G. B. Miller, Racine Hydraulics & Machinery, Inc., Racine, Wis.

NEW HAVEN—Christmas party. Date to be announced.

NORTH TEXAS—Dec. 11, 7:30 p.m., Amon Carter International Airport. "Precision Investment Casting" by K. J. Yonker, plant manager, Howard Foundry Co., West Allis, Wis.

NORTHERN MASSACHUSETTS—Dec. 15, 7:00 p.m., Athol, Mass. "Non-Destructive Testing" by Francis G. Tatnall, Baldwin-Lima-Hamilton Corp., Eddystone, Pa.

PITTSBURGH—Dec. 4, Alcoma Country Club. Ladies' Night.

PHILADELPHIA—Dec. 17, Broadwood Hotel. Christmas party.

POTOMAC—No December meeting.

ROCHESTER—Dec. 7. "Facts about Taps" by Oscar Koehler, chief engineer, Greenfield Tap and Die and Burke Steel Co., Rochester, N. Y.

ROCKFORD—Dec. 10. Ladies' Night.

SAGINAW VALLEY—Dec. 5, 7:00 p.m. Zehnder's Hotel, Frankenmuth, Mich. Christmas party and Ladies' Night.

SAN DIEGO—Dec. 14, 7:00 p.m., El Morocco Club. "Engineers Chart Future on Taconite Mining" by William Keller, tool engineer and planner, Consolidated Aircraft Corp., San Diego.

TOLEDO—December meeting. "Surface Broaching on Jet Engine Parts" by James W. Dopp, service engineer, LaPointe Broach Co. Also Past Chairmen's Night.

TORONTO—Dec. 2, 6:30 p.m., Toronto Union Station. "Modern Machining Methods" by H. Edward Neale, assistant sales manager, Bullard Co., Bridgeport, Conn.

TWIN STATES—Dec. 9, Windsor House, Windsor, Vt. "Tooling of Small Precision Parts" by N. Kenneth Perkins, project engineer, International Business Machines Corp., Poughkeepsie, N. Y.

TUCSON—No regular December meeting is scheduled.

Robert H. Krepps

Denison Representative Addresses St. Louis

St. Louis—The October 1 meeting of the St. Louis chapter was held at Hotel DeSoto and 175 members and guests attended. Preceding the technical session, Chairman Willis Potthoff read excerpts from a gratifying letter from Don Fogarty, recipient of last year's scholarship award, and an engineering graduate of St. Louis University. Mr. Fogarty is now a process engineer with a large eastern manufacturer.

Robert H. Krepps, sales manager of the Hydraulic Press Division, Denison Engineering Co., Columbus, Ohio, presented the technical portion of the program which consisted primarily of a film depicting the versatile Denison Hydraulic Multipresses.

—E. Grasser, Jr.

George Pope Addresses Nashville Group

Nashville—Guest speaker at the Nashville October 20 meeting was George H. Pope, supervisor of test operations, Aro, Inc., AEDC., Tullanoma, Tenn. The topic of his lecture was "Propulsion Wind Tunnels, Both Types of Circuits." Guests included Fred W. Hollenbach, C. L. Ward, C. M. Howard, R. H. McDowell, and Ray C. Phillips of Aro. *—J. E. Wilkinson*

N. F. Aynes Talks at Twin-Cities Meeting

Twin Cities chapter met on October 7 to hear N. F. Aynes, assistant sales manager, The Louis Allis Co., Milwaukee, Wis. His talk was devoted to special motor drives for industry and the development and use of special motors tailored to the application.

—Walter J. Comstock

West Coast News

Coated Abrasives Topic at Chautauqua-Warren

Author Presents Views on the Cutting Edge

Poughkeepsie—"The Cutting Edge" was the subject of a talk given to approximately 125 members and guests of Mid-Hudson chapter on October 13 by Leo J. St. Clair, author of the book "Design and Use of Cutting Tools."

Mr. St. Clair stated that the cutting edge is not considered often enough, mainly because the action taking place canot be seen. Only theory can be applied as to what takes place under the influence of two different kinds of chips, the continuous chips from cast iron and the continuous chips from steel. Of the two types of materials, the cast iron is the harder on the cutting edge, since the contact between the material and the cutting edge must be close. The point of contact can be regulated on the continuous type chip from steel by the variance of feeds.

He described in detail the process of build-up on tool edges and recommended some corrective measures which could increase tool output from 200-300 percent.

New members were also introduced. They are: Elias Bender, Robert Davis, Ralph DeVoe, James Drew, Thomas Ferry, Michael Flynn, Walter Shaw, Richard Smith, John Zeleznik, Lester Wright, Richard Barclay, A. Peter Barth, Dominic Casulli, Vincent Cavalier, Kenneth Colton, Jesse Duncan, Roland DuSault, Herman Geisler, Vincent Griska, Watson Guilfoil, William Hof, Frank Mayer, Lester McHerron, and Joseph Negler.

—Herman J. DePew

John Hussey and L. J. Sheehan

Developments in Metal Turning Discussed

Chicago—The regular monthly meeting of the Chicago chapter was held October 5 at Keyman's Club and drew a crowd of 140.

The meeting featured two technical talks on "New Developments in Metal Turning." The speakers were: John Hussey, sales engineer, American Tool Works Co., and Lester J. Sheehan, chief metallurgist, Jones & Lamson Machine Co.

Mr. Hussey's talk dealt with metal turning of parts using lathes equipped with tracers for contour cutting. Mr. Sheehan presented a talk on carbide tool turning at various speeds and feeds and showed a movie to illustrate the cutting principles he discussed.

—R. C. Berliner

Boston Chapter Holds Annual Executive Night

Boston—The New England Mutual Hall was the scene of Boston's Executives Night on October 8 when some 225 members and guests convened.

Chairman Wilfred B. Wells opened the meeting with a resume of chapter happenings and introduced guests at the head table. He called upon Dean Alfred J. Ferretti of Northeastern University, Boston, who spoke on the importance of early training for tool engineering, stressing that it should be taught in early high school.

Robert E. Dean, chairman of the education committee was then introduced to award scholarships to two Northeastern University students. The recipients of the awards were Robert Ciccarelli and Robert A. Kirk.

The featured speaker on the evening program was James Y. Scott, president, the Van Norman Co., Springfield, Mass., and president Morse Twist Drill Co., New Bedford, Mass. He is also past president of the National Machine Tool Builders Association.

—Harry Midgely

Grand River Valley Tours Frigidaire

Galt, Ont.—Three busloads of Grand River Valley chapter members traveled to Toronto on October 2 to view the new plant and production setup of Frigidaire, Ltd. The members enjoyed a sound movie on refrigeration in Frigidaire's 500-seating-capacity auditorium before touring the plant.—*W. C. Little*

Industrial executives from the Boston area were among the 225 persons who attended Boston's Executives Night meeting

Granite State Chapter

West Coast News

By Andrew E. Rylander

Got around a bit in October, particularly having taken a trip down to San Diego and Los Angeles with intent to take in the chapter meetings. Leaving Walnut Creek the morning of the 6th, had figured on making the southern chapter by evening. But, what with slow traffic and having underestimated the time to wind through L.A., arrived too late. However, managed to visit Solar and Ryan aircraft companies before leaving the following morning. Ryan has sure grown since building the Spirit of St. Louis for Lindy's hop to Paris.

Arriving early for the Los Angeles meeting, looked around for a familiar face, finally spotted Ralph Chrissie. After that, got acquainted fast. Then, in the crowd, met *auld acquaintances*, Morris Gottlieb, Tony Peck and Art Denis, the latter back from Detroit with news of Jimmy Giern and partner Andy Anhollt, both now hobbying out Romeo way. In the general handshaking, met George Nelson, late of the Hudson Tank Arsenal, and Bill Winquist.

Later, finding a place below the salt and getting acquainted with my table mates, was invited to the head table by Director Ben Hazewinkel. Thereby, met Frank X. Balé, chapter treasurer who accents the *e*. Was extended the courtesies due a visitor by Ch'man Carl Almquist and his fellow officers.

Goal in Sight

According to membership ch'man Al Beaumont, Los Angeles is now the third largest ASTE chapter and out to pass the thousand mark by year end. Well, the boys are on the ball and if "will to work" means anything, they should make it.

Speaker Ken Martin of Cincinnati Milling gave an interesting talk on Hydroforming, a talk highlighted by clear enunciation and a commendable brevity that, omitting no essentials, left plenty of time for questions and answers. His manner of presentation could be advantageously emulated by many speakers, myself included. The meeting wound up with a color movie, "Tool and Die Making," which made me realize that I was born too soon.

Managed to call Art Lewis and to visit Ben Hazewinkel at Daily Grinding, a visit made enjoyable by the evident efficiency of his organization.

Back home to enjoy a visit from John Rotchford of Lodding, Inc., who brought news of Vic Ericson and other friends in the Worcester area. Seems we'd been following each other's trails along the Coast; anyway he and Ken Martin should be well acquainted by the time they finish their western tours.

A nice meeting at Santa Clara Valley, where Ken was also guest speaker and John a guest of honor as due a member of the National Standards Committee, the same going for the meeting of Golden Gate chapter on Oct. 21. No trouble whatever in hearing Ken twice, as high a compliment as I can pay a speaker. Via Ken relayed greetings to Swan Bergstrom.

Class Attends Meeting

Guests at the meeting included my class in *Advanced Tool Engineering*, thus giving those not already members an insight into how ASTE chapters operate. Impressions must have been good since another of the boys has been OK'd for membership. Among visitors I had the pleasure of meeting was J. H. Bungartz of Cincinnati Milling, friend of likeable Rip Collins of whom we exchanged some lively reminiscences.

Coffee speaker was Dr. George L. Sullivan, member of the State Bd. of Registration for Civil and Professional Engineers, who gave a comprehensive outline on the steps needed to qualify for professional engineering registration in California. All told, it was a fine meeting and for once I didn't get lost coming or going.

News from the northern chapters highly encouraging, Seattle having scheduled excellent programs running through '53—'54. Portland making progress what with old wheelhorses like Mel Nielsen, Walter Brenneke, Bill Brennan, Dan Meolody and Prof. Sheely in there pitching, not forgetting other old-timers as well as new blood that keep things moving.

So much for that and now back to the daily grind including teaching which should wind up toward the end of the year. And now, the year drawing to a close, my best wishes for a Merry Christmas and a Happy New Year to ASTE'ers North, East, West, South.

Coated Abrasives Topic at Chautauqua-Warren

Jamestown, N. Y.—The regular monthly meeting of the Chautauqua-Warren chapter was held October 15 at the Masonic Temple. The guest speaker for the evening was William A. Corse, assistant manager of sales engineering, Coated Products Division, Carborundum Co., Niagara Falls, N. Y.

Mr. Corse outlined the various types and uses of coated abrasives, the trend toward the use of them in high production in industry, and the manufacture of special machinery by various companies for coated abrasive products.

Two 16-mm sound films entitled "Manufacture of Coated Abrasives" and "Coated Abrasive Machines" were shown following his talk. After the films, products and work samples were shown to the audience.

—Laurence R. Green

Wichita Chapter Hosts Engineering Students

Wichita, Kan.—Members of the Wichita chapter were hosts to engineering students of the University of Wichita who are interested in forming a student ASTE group under the sponsorship of the Wichita chapter. The meeting took place at Wolf Cafeteria on October 14.

Harold Shigley, student sponsor, introduced Prof. Kenneth Razak, dean of aeronautical science, who was recently made an honorary chapter member.

Featured speaker of the evening was Frank Suchanek, sales manager of Sundstrand Magnetic Products Co., Rockford, Ill., who spoke on "Magnetic Holding of Parts for Machining." He traced the story of magnetism and the part it has played in human lives from the aid of the crude compass to modern day research. Mr. Suchanek revealed tips on handling of materials, saving machining cost and setup time, reducing operator fatigue and clamping of unusual shapes.

—John G. Temple

Record Crowd Hears Wax Company Speaker

Washington, D. C.—Some 190 members and guests of the Potomac chapter met at the Hamilton Hotel on October 30 to hear J. P. Guyer, eastern regional supervisor, Johnson's Wax Co. His topic was "Wax and its Use in Industry." The largest attendance since 1951 was recorded at this meeting.

—F. E. Bellin

News in Metalworking . . .

Granite State Chapter Hears Atomic Lecture

Exeter, N. H.—The Granite State October meeting featured a talk by Charles Victor Moore, General Electric Co., Knolls Atomic Power Laboratory, Schenectady, N. Y.

Mr. Moore's talk, "Atomic Energy for the Layman," consisted principally of the machining of metals used in nuclear reactors, their various characteristics and applications. At present he is designing a nuclear reactor to be used for the propulsion of a nuclear-powered submarine. —*C. P. Radwan*

Peterborough Chapter Hears Bob Worrall

Peterborough—The Peterborough and District chapter held its October 8 meeting at the Empress Hotel. Feature attraction of the evening was the talk by Bob Worrall, district representative, British-American Oil Co. He devoted his words to the laying of the recently completed oil pipeline from Montreal to Hamilton.

—*Fred H. Mason*

Salt Lake City Meets with Engineering Council

Salt Lake City—The semiannual joint meeting of Salt Lake City chapter and the Utah Engineering Council was held on October 23 at the Bonneville Room of the New House Hotel. George M. Gadsby, president of Utah Power and Light Co., addressed the group on "Energy Trends." —*Reid L. Rice*

Carbide Reaming Topic at Philadelphia

Philadelphia—The Philadelphia chapter had as its guest speaker in October Charles M. Carr, chief engineer in charge of research and engineering at Staples Tool Co., who is also a member of the Cincinnati ASTE chapter.

Speaking on "Carbide Reaming", Mr. Carr stated that carbide reamers have become relatively cheap and consequently have become subject to some misapplication and abuse. He stated further that the main problems stem from poor sizing, inferior finish, poor tool life, and materials not suitable for carbide reaming. Mr. Carr said these problems would disappear when staggered flutes, concentric shanks and OD's, OD's lapped with diamond powder, and large amounts of coolant were employed.

—*Jack Schroth*

The first woman to join the ranks of the Kansas City ASTE chapter is Mrs. Patricia Al-Iman. With a background of tool design experience for engineering firms in the Canal Zone, Mrs. Al-Iman is now associated with the Aircraft Section of General Motors Corp.

Amber Brunson Talks on Surveying Instruments

Kansas City, Mo.—The regular monthly meeting of the Kansas City chapter was held at Roselli's Restaurant on October 7 with 45 members and guests in attendance.

Amber Brunson, past chairman of the Kansas City chapter and owner of Brunson Instrument Co., Kansas City, presented a talk on "Surveying Instruments." —*Richard Corliss*

Refresher Course Sponsored by San Diego

San Diego—The San Diego chapter announces a refresher course at California Western University, San Diego, under its sponsorship. The course will run one night a week for eight weeks with one major topic under discussion each week. Under discussion will be titanium forming, metal bonding, tool economy, plastic tooling, advanced die design, tool steels, precision casting, and optical tooling. —*William Keller*

Phillip McKenna Talks to Hamilton District

Brantford, Ont.—Approximately eigthy members and friends attended the October 16 dinner meeting of the Hamilton District chapter at Brant Hotel.

John M. Snyder introduced the speaker of the evening who was Phillip M. McKenna, president and director of Kennametal, Inc. His topic was "Principles of Design of Cemented Carbide Compositions."

—*John Litwin*

Silicone Products Reviewed at North Texas

The Amon Carter International Airport was the scene of the first regular monthly meeting of the North Texas chapter on October 9. On hand was M. H. Leavenworth, manager, southwestern branch office, Dow Corning Corp., Midland, Mich.

Mr. Leavenworth's talk, "How the Tool Engineer Can Use Silicones." touched on the adaptability of silicone rubber, fluids, grease, resins, and other silicone products. He gave a physical demonstration to show the resistance and endurance of silicone products under conditions of extreme heat and cold, moisture, wear and lubrication qualities over long periods of time.

—*F. Paul Simpson*

Elmira Views Cornell Atomic Equipment

Ithaca, N.Y.—Members of the Elmira chapter journeyed to Cornell University for a conducted tour of the Nuclear Studies Laboratory on October 5. Of particular interest to those in attendance were the synchroton and the mesotron, both pieces of atom-smashing equipment.

Professor Grantham of the Cornell physics department gave a demonstrated talk on engineering physics including the three basic laws. Also on the program were short talks by Dr. Littauer and Mr. Van Amber, both of Nuclear Studies, who outlined the building of the atom-smashing equipment. J. Fitzgerald of the Cornell staff welcomed the group to the university.

—*John D. Graham*

New Haven Records Long Technical Session

New Haven—A full program including plant tour, dinner, and technical meeting, was scheduled for the October 8 meeting of the New Haven chapter. The plant tour took place in the afternoon with members and their guests visiting the M. B. Co. plant on Fitch Street, Hamden, and the State Street plant.

The group then convened at the Hotel Garde for dinner and a technical session. Three talks were on the agenda. One speaker was E. J. Bliard, design engineer for the M. B. Co., who spoke on "Basic Tool Design—Considering Flexibility." J. A. Dickey, general manager of the company, gave a talk entitled "Vibration in Machine Operations," and E. G. Oravec concluded the talks with his address on "Applications of Vibration Control."

—*Silas W. Becroft*

FINISHING METHOD LIGHTENS CUTTING PROBLEMS

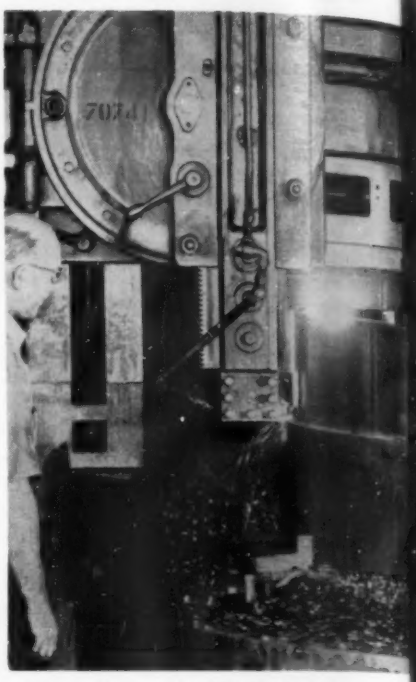
N O W

News in Metalworking . . .

CARBIDE FOR HEAVY DUTY CUTTING

As first in a series of heavy duty steel-cutting carbides being introduced by Carboloy Dept. of General Electric Co., Detroit, Mich., the new grade 370 cemented carbide indicates several qualities to come. It was primarily developed for taking heavy cuts at higher tool temperatures, and maintains its rigidity, eliminating cutting tip deformation at temperatures as high as 1800 F. According to tests results of more than 15 companies testing the carbide, users may expect longer production runs on heavy duty steel cutting operations, due to this tailoring for severe cutting conditions. On the work done during these tests, cutting edges of grade 370 were reported to have lasted up to 50 percent longer without deforming despite high temperatures.

The substance is composed of tungsten carbide, titanium carbide, tantalum carbide and cobalt; has a density of 12.60, and a Rockwell hardness on the A scale of 91.0. The structure obtained has a rigidity that permits the tip made of it to take one-fourth to one-half more depth of cut at higher speeds. For example, one plant, in machining steel mill rolls forged from chrome-nickel-moly steel, uses the grade 370 to take cuts of 1 inch in depth while the tool travels at a speed of 80-100 sfpm. Feed of the tools is 0.054 in.



Above, the grade 370 carbide blank is making ½-inch cuts on the outside diameter of a high-carbon, manganese-nickel retaining ring.

Below, closeup of the new grade in action shows a tool made of this carbide taking a 1¼-inch cut on a 75-inch diameter forging used for a cylinder head in a hydraulic steel forming press.

13 Key Moore Tools help put the PRECISION in Harig Dies

KARL HARIG

"When owner-management invests its money in machinery," says Karl Harig, founder and president of Harig Manufacturing Corporation, "it does so only after a thorough analysis and careful selection of available equipment." So it's significant that Harig, one of America's foremost producers of carbide, lamination, progressive, stamping and other types of precision dies, employs 13 Moore precision-built machine tools for many of its most critical toolroom operations.

A trip through Harig's modern Chicago plant reveals:

3 MOORE JIG BORERS, for accurate locating and boring of holes in a fraction of the time required by other means;

6 MOORE JIG GRINDERS, for relocating and grinding of holes and contours—within tenths—after hardening;

3 MOORE PANTO-CRUSH WHEEL DRESSERS, for speedy, cost-cutting performance of both crush-forming and diamond-dressing on the wheel spindle of a surface grinder;

1 MOORE DIE FLIPPER, for "mechanized" die tryouts and assembly.

The combination of Harig craftsmanship and Moore precision tools has been an important factor in Harig's successful effort to meet continuing demands for faster production of intricate dies, tools, jigs, fixtures and gauges.

Why not discover how Moore tools can bring more speed and greater accuracy to *your* toolroom. Write today for our detailed literature.

Moore Special Tool Company, Inc.
732 Union Avenue, Bridgeport 7, Connecticut

A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.

Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.

Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.

A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

ADD MOORE TOOLS TO YOUR TOOLROOM

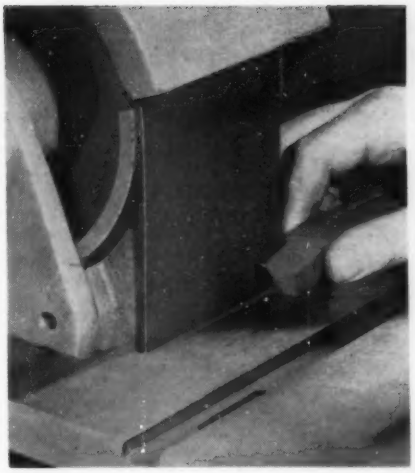
JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-110

of America, deliberately oversize in slot in the tail of the replaceable blade of time and effort. The job is now

FINISHING METHOD LIGHTENS CUTTING PROBLEMS



Use of carbide cutting tools throughout the metalworking, woodworking and plastic industries, may well be considerably expanded due to a method of final finishing introduced recently by Minnesota Mining and Manufacturing Co., together with Hammond Machinery Builders.

The method, which is based on use of low-cost abrasive paper belts and a new-type belt machine, suggests two major advantages—simplification of the sharpening job on carbide tools, and reduced over-all costs. Yet, it results in even a better edge than might be obtained by present methods.

Primarily, it is intended to supplement, or possibly replace the conventional diamond wheel method, particularly where initial cost of diamond wheels is prohibitive. Or further, the new process might prove of particular profit to the company who has no skilled diamond wheel operator available, and finds standard shop practice in tool sharpening unsatisfactory.

An additional advantage lies in the fact that with this method it is possible to finish the flat top of the tool, an often neglected area that is needed for maximum tool mileage and finish.

Technique for the sharpening operation involves two steps: rough grinding on a standard grit 60-silicon carbide wheel; and finishing the sides and top of the carbide tip on the belt machine using a Tri-M-Ite Resinite abrasive belt ranging from grit 60 to 150, depending on the edge required. A 1/6-inch wide land is finished from the cutting edge down. This land is at the desired clearance angle and is flat, not hollow ground.

The operation is accomplished on a special machine designed jointly by the two companies. It is similar in design to diamond wheel grinders, and employs the same type calibrated tilting table, which swings aside to allow quick belt replacement. Other features include a tungsten carbide-faced platen for accurate flat surface finishing, a work table with side supports for sharpening angular tools, a positive abrasive belt-tensioning device and belt-tracking adjustment.

SIMPLE CHANGE EFFECTS COST AND LABOR ECONOMY

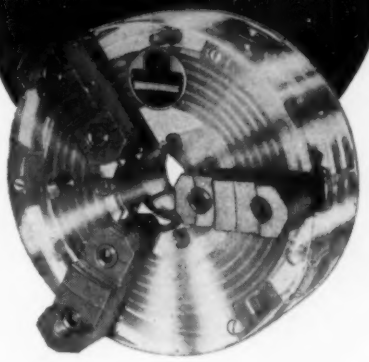
Benefits of reconsidering from time to time its present methods and machinery again have been proved profitable, this time for Millit, Inc. in Rochester, N. Y. In the design of a type of milling cutter, the company has found that by substituting tapered end, hollow, split pins for ordinary dowel pins, they could simplify manufacturing methods and also lower fastener costs. By providing a replaceable blade having maximum tooth rigidity, it was discovered the advantages of the solid body milling cutter with those of the inserted-blade type might be combined. Rigidity is obtained by seating the replaceable blade on the periphery of the cutter body, against a body abutment that takes all cutting forces. Blades are accurately doweled in place at two points. The shank of the cap screw which fastens the blade in place dowels into a reamed hole, and a Rollpin through the body abutment fits into a slot in the tail of the blade.

This pin's function is to accurately locate the tail of the blade laterally, and to take some of the side thrust exerted on the cutting blade. Most of the side thrust is taken by the cap screw. With its conical seat in the blade, the cap screw cams the blade tightly back against the cutter body abutment, by means of an interference of from 0.004 to 0.007 in. between the reamed cap screw hole and the abutment.

Though the work might normally have been done by a solid dowel pin, Millit chose the Rollpin instead primarily because of cost. Based on quantities of 5,000, cost per pin would have been $1.75 greater had conventional pins been used.

At the same time, these pins afforded savings in manufacturing operations. The split hollow pins with tapered ends are made by the Elastic Stop Nut Corp.

NOW SEE what HORTON CHUCK EXTRAS can do for you!



SEE the actual operation of a Horton Chuck with the new Plastic Demonstrators.

NOTICE the pilot hole construction of the independent chuck and the replaceable pinion bushings of the Scroll Universal Chuck — both Horton Exclusives.

ASK your Horton Distributor for a demonstration now. or write to . . .

HORTON CHUCK

Windsor Locks, Conn.

INDICATE A-12-111

of America, deliberately oversize in relation to fractional drill sizes. Heat treated to give it the needed properties, they are driven easily into holes, and expand against the hole walls to hold themselves in place regardless of strain or vibration, yet can be driven out easily and used again.

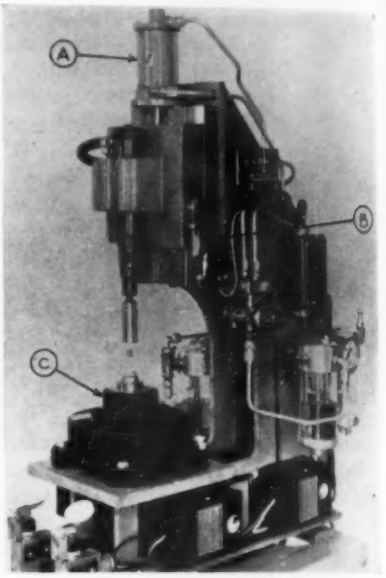
A reamed hole is unnecessary for the press fit required in the cutter body, since the pin is oversize and expands to fit. This saves a secondary machining operation and lowers the manufacturing cost. In addition, the company does not have to hold the width of the slot in the tail of the replaceable blade to extremely close tolerances because the pin compensates for slightly oversize or undersize slots.

AIR HELPS TOOL SPEED ASSEMBLY JOB

An interesting case study demonstrates the advantage one company gained through use of air power.

In this application, an ingenious combination of electrical and pneumatic devices drives home the locking nut on Duchess spark plugs, with a minimum of time and effort. The job is now accomplished during an operation with a time cycle of three seconds. The machine to do the job was designed and built by Crusota Engineering Co., using a number of standard units from Mead Specialties Co.

Speeded up assembly work on spark plugs is the result of this sequence of operation: After the spark plug is placed in the collet fixture (C), the main air valve is opened on the opposite side of the machine to supply collet pressure. Depressing the micro-switch, located on the left, for momentary contact shifts the four-way double solenoid valve; and the double acting cylinder (A) moves the dovetail slide, carrying the nut setter toward the plug.

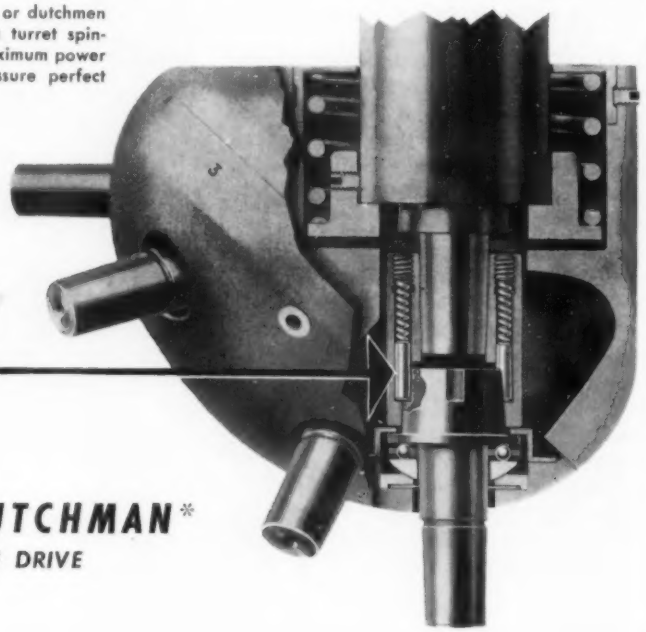


Prior to setter socket engagement over hex nut of the plug, the cam finger (B) attached to the dovetail slide, trips the microswitch roller which energizes the two-way solenoid suplying air to the nut setter. At the same time, tripping of this micro-switch starts the timer motor.

The socket is controlled by a built-in clutch, while the timer is adjusted to allow air to the setter only sufficient to throw the clutch. The solenoid controlling setter air then is reversed by the timer, freeing contact pressure between the socket and nut prior to the socket's upward travel.

Depression of the micro-switch on the right for momentary contact, then shifts the four-way double solenoid valve. The double acting cylinder moves the dovetail slide up to the original position. Upward travel of the slide removes the cam finger attached to slide from the micro-switch which de-energizes the timer motor and allows a reset for the next operation.

Two spring loaded pins or dutchmen automatically lock each turret spindle to the driver for maximum power while mating tapers assure perfect alignment



NEW

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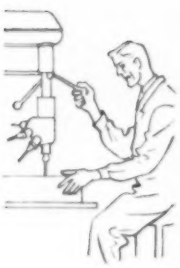
POSITIVE DRIVE



FOR MORE HOLES PER HOUR PER DOLLAR WITH LIGN-O-MATIC® SELF-CENTERING TURRET

SPEED — 6 consecutive operations on one standard drill press — no time lost changing tools or moving work.

POWER — Any tools your ½ in. chucks can hold and your drill press can drive in any material.

ACCURACY — Exclusive self-centering feature insures perfect alignment — CUTS tool and fixture wear.

PRICE — MODEL E — FOB So. Norwalk, Conn. $285.00

**Trade Mark*

Please send Bulletin 5312, containing complete specifications.

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TITLE_____

(Attach to company letterhead)

HOWE & FANT, INC. 544 FLAXHILL ROAD SO. NORWALK, CONN.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-112

Tools of Today . . . .

Testing Unit Gives Universal Measurement

A machine of 50,000 lb. capacity in tension and compression, the Model FGT, is believed to be the first production testing machine in which SR-4 resistance wire strain gages are used for load measurement. Two maximum-precision-type SR-4 load cells of 25,000 lb capacity each, located at the base of two vertical tie rods, measure loads with extreme accuracy and sensitivity.

It is considered actually more universal than previous "universal" testing machines, and with suitable accessories is capable of testing specimens of structural parts and components not only in tension, compression and flexure, but also while they are subjected automatically to alternating reversed loads, creep, stress relaxation, torsion and shock.

Among the features incorporated into the design are greater convenience and flexibility of automatic load reversal. The load cycling system permits adjustment of control points by two load indicating dial knobs to any two loads between 50,000 lb compression and 50,000 lb tension. Thus cycling may be kept with specific tension and compression ranges or between any tensional and compressional loads. Cycling rate depends on strain amplitude with the machine's speed limits which range normally from 9 to 2 ipm for 10,000 to 50,000 lb loads. Loads are applied to the bottom platen by a single reversing power screw from a variable speed electric motor. Maximum power stroke is 8 in.

Indicator dial on the unit has its zero at the top with 500 divisions plus and 500 divisions minus for indicating compression loads (counter clockwise) and tension loads (clockwise). Four ranges provided are from 0 to 1000, 2500, 10,000 and 50,000 lb. An additional four ranges (from 10 to 500 lb) are available for the universal load cell of 500 lb capacity.

The strain cycling system provided is controlled by a plus and minus separation of the gage points of an extensometer operating through an SR-4 type stress strain recorder. For yet another cycling, "head-travel", the machine has upper and lower head motion reversal stations.

Head motion speed can be held constant at any setting of the speed control knob. Constant rates of load application and strain are possible through pacing disks. Load pacing is adjustable according to capacity per minute.

By setting cycling controls at zero rate, load, strain and platen position also will remain constant.

Since load can be applied in two directions, all testing is done within a single opening of convenient height.

A stress-strain recorder, Model SRA-1, primarily for use on this universal testing machine records strain on a chart from indications of wire strain gages or extensometers. (The recorder is being used with the unit at the right in the photograph below.) Load is recorded by movement of the stylus parallel to the axis of the drum driven mechanically by the load indicator mechanism of the testing machine.

Records may show continuous reversals between tension and compression when the recorder is used on the testing machine with an extensometer. Positioning of the stylus can be altered to obtain information on varied loads and ranges. Magnification ratios and measuring ranges can be established for different test requirements.

The unit is made by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

T-12-1131

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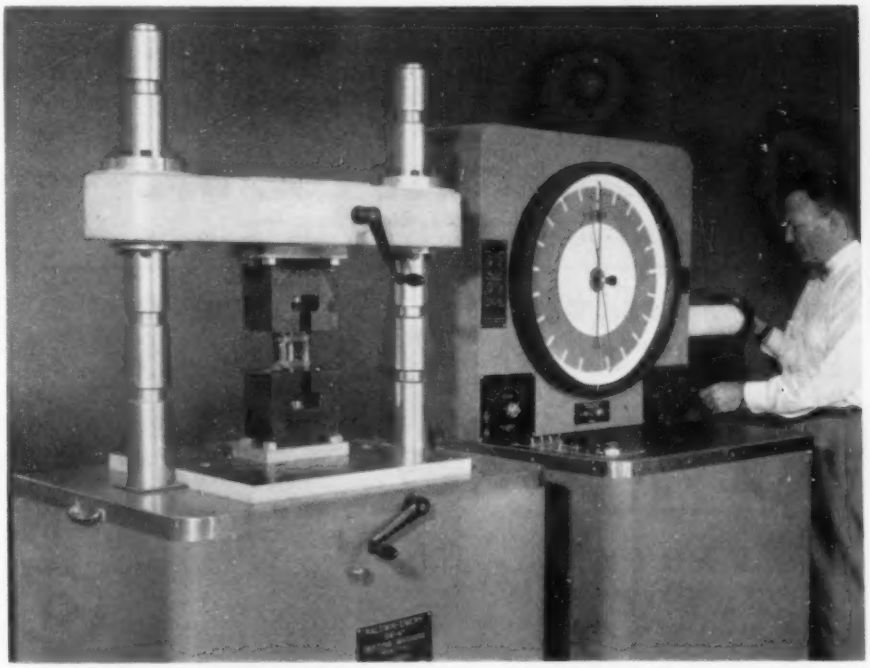


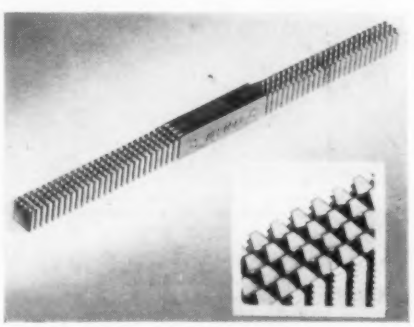
Thread Restoration

External threads which have been damaged or deformed can be quickly returned to original condition without reducing the root and outside diameters by Nu-Trix, a thread restoring tool developed by the Reiff & Nestor Co., Lykens, Pa.

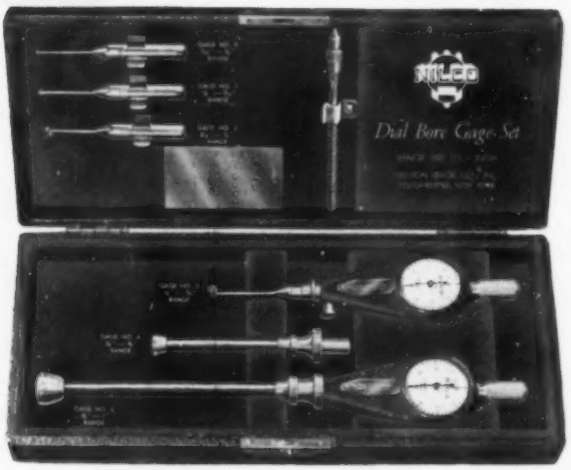
Nu-Trix avoids shaping methods which remove metal from the thread diameters, and which result in loose fits. With this tool, used like a file, a few quick passes across the damaged threads remove burrs and deformed metal and reshape threads to original conditions.

The Nu-Trix thread restorer is made of hardened steel; 8½ inches long and 7/16 inches square. It is available for either National Coarse or National Fine threads. There are eight thread sizes on each tool.

T-12-1132



SAVE $250 on precision
DIAL BORE GAGES



6-Gage Economy set range .090" — 1".

Save 25% by purchasing these beautifully designed, long lasting NILCO Dial Bore Gages in sets! They are interchangeable
Save on production costs! Operators using NILCO Dial Bore Gages see the condition of the holes and control the size right at the machine. Better parts and fewer rejects are the result.

NILSSON GAGE CO., INC.
Poughkeepsie, New York
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MORE ROLLER BEARINGS PER MINUTE—
with a
SYNTRON
PARTS FEEDER
Automatic — Oriented Single Line Feeding

Syntron EB-O Parts Feeder feeding roller bearings to a centerless grinder.

Provide fully automatic, oriented, single line feeding of parts to automatic machines. Models available for parts of most shapes and materials. Electromagnetic operation, with finger-tip control.

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SYNTRON COMPANY
340 Lexington Ave. Homer City, Pa.
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Radial Drilling Machine

A universal radial drilling machine, Model 568, is motorized to reduce manual operations, increase flexibility and reduce nonproductive setup time.

Two directional switches are positioned on a handle (just under the tachometer dial in the illustration) so that pressure of the hand actuates a motor to retract the head. A pulling motion actuates the second switch to cause the head to advance. Final positioning of the head is effected by a handwheel so holes can be located within less than 0.001 in. A second set of switches actuates another control motor to elevate or depress the head. Both sets of controls can be used at

the same time. The head can move 23 in. vertically, in addition to the 4¾-in. spindle travel, and 20½ in. horizontally.

Swing of the head is manual with exact position maintained by an electric brake. The head can swing to any position in a 360-deg. circle for drilling on or off the table. The head can be rotated 90 deg from vertical to either side to permit horizontal drilling. Any hole with an interemdiate inclined angle can also be drilled.

The spindle feed can be manual, automatic or a combination. With the machine set for drilling, the capstan can be manually turned to bring the drill close to the work. Release of the capstan permits the automatic feed to operate. An automatic stop can be set

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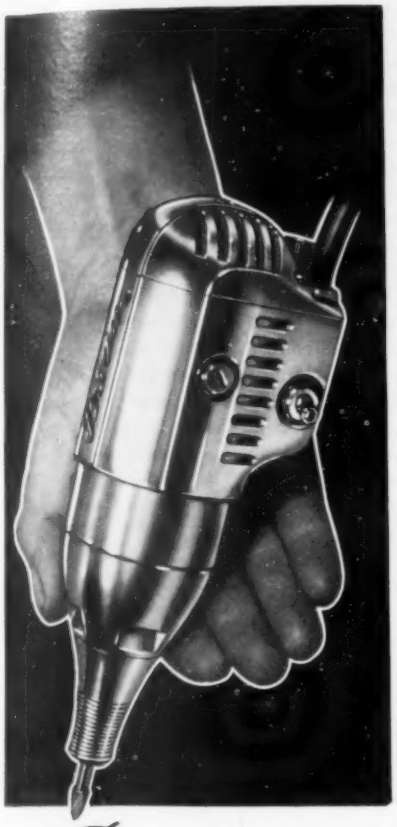
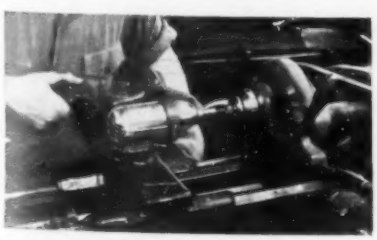


Precise

SUPER 30

OUTWORKS, OUTLASTS ANY TOOL IN ITS FIELD

Twice the power and speed in smaller size and less weight for more uses. Exclusive features include PRECISE Spindle and *draw collet chuck* for precision and quick, easy tool change. Operates *tungsten carbide* Midget Mills as efficiently as conventional rotary tools for grinding, milling, finishing, polishing and other applications on soft and hard materials including the hardest alloy steel. Micro-precision bearings have lubricant sealed in for life; AC/DC motor is air-cooled. Tool measures only 7⅜" long and tapers from 2⅛" at mounting diameter to only ⅛" D. at chuck nose. Unique PRECISE Mounts a available for set-ups on machine tools.



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PRECISE PRODUCTS CORPORATION

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INDICATE A-12-115-1

for the desired drilling depth. During automatic feed, a slight counter pressure on the capstan will stop the feed. With the machine set for tapping, spindle rotation is reversed automatically as the capstan rotation is manually reversed.

A quick-change chuck is used in the spindle so drills and taps can be rapidly interchanged. Spindle speed is reduced for the change but the spindle is not stopped.

Drilling power is furnished by a 1.5-hp 3000/1500-rpm motor mounted on an eccentric. A ratio of 1:2 is possible through an infinitely variable pulley system, and a 1:4 planetary reduction gear gives high torque without vibration at low speeds. These units combine to give a drilling speed anywhere between 100 and 1600 rpm. All speed changes can be made with the machine in motion.

Specifications include: automatic feed at 0.0025, 0.005 or 0.010 ipr drilling capacity of 15/16 in. in steel and 1¼ in. in cast iron, and a tapping capacity of ½ to ⅝ in. in cast iron.

Designed and manufactured by Moteurs Constan, France, these machines are available about twelve weeks after order from the American distributor, H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N.Y. **T-12-1151**

Jetweld

Unusual approach to electrode design, representing a development comparable to the introduction of extruded "shielded-arc electrodes" and the low hydrogen electrodes, has resulted in the Jetweld, which incorporates powdered metal into the electrode coating. Advantage of this is that it uses the heat of the arc more efficiently than other types of hand electrodes to achieve extremely fast hand welding speeds with the higher standards of weld quality, appearance and ease of operation.

Jetweld is a heavily coated shielded-arc type of electrode for operation in flat or near flat positions with a-c or d-c welding current. It meets the physical requirements of class E-7016 and is used on work formerly calling for E-6012 and E-6020 electrodes on single pass or multiple pass welds. It seems especially suited for horizontal and flat position fillets, horizontal and flat position laps, single and multiple pass butts, deep grooves and corners, cover pass on multiple pass butts. It also welds some higher carbon steels without cracking and without surface holes.

Weld metal is uniform X-ray quality, free from undercut with excellent impact values at low temperatures. Typical physical properties, as welded, are:

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IT'S THE LONG STROKE UNIT!

12" stroke on base only 16⅜" long. Or smaller model, 9" on 13⅜" base. LONG STROKE makes it easy to change tools. TRAVERSE RATE over 400" min., FEED RATE up to 30" min. CAPACITY ½" in steel.

Self-contained, completely hydraulic. Unusually accurate and dependable. Especially adapted to use on transfer machines. For catalog-folder and data sheets, write DRILLUNIT, INC., 3269 Wight St., Detroit 7, Mich.

INDICATE A-12-115-2

NATIONWIDE METALWORKING SERVICE ON . . .

OVER 800 DIFFERENT NELCO CARBIDE TIPPED TOOLS!

. . . to fill 90% of all special tool applications!

Whether the job calls for special or standard cutters, check the Nelco distributor in your locality — a Nelco carbide tool to do the job, *as quickly and efficiently as any "special" that could be built,* is probably on his shelves. Every standard Nelco tool comes in a wide variety of sizes to assure you the cutter you want, when you want it — without delay, without "special tool" cost! Every precision engineered Nelco carbide cutter has been production proved to outperform, outlast conventional cutters — to cut toughest metals in less time — to yield more pieces . . . to produce better finishes . . . to guarantee prolonged tool life.

A Nelco field engineer will be glad to call — "troubleshoot" in your plant—on your machines —save you production hours, production dollars!

FOR COMPLETE LISTING AND PRICES OF THE VERSATILE NELCO LINE, SEND TODAY FOR THE NEW NELCO 48 PAGE CATALOG!

NELCO TOOLS

For that Extra EDGE in Production

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

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tensile strength, 93,000 pounds per square inch; yield point, 79,000 pounds per square inch; elongation in 2 inches, 15 percent to 22 percent. Typical Charpy keyhole impact value at room temperature is 28 foot pounds. At –70 F value is 20 foot pounds.

Welding speeds typical in lap and fillet work are on the order of 12 to 15 inches per minute, while other electrodes produce 6 to 8 inches per minute on the same type of work. Bead appearance is smooth, comparable to that normally associated with automatic hidden arc welding. The slag produced curls off as it cools to make the welds practically self-cleaning. Welds are also virtually spatter free. It has a smooth, stable arc action which is highly resistant to arc blow. A drag electrode, it is operated with the coating touching the work, making for ease of operation as well as simplifying operator training. Elimination of coating breakdown permits using the entire coated portion of the electrode, reducing stub loss to a minimum.

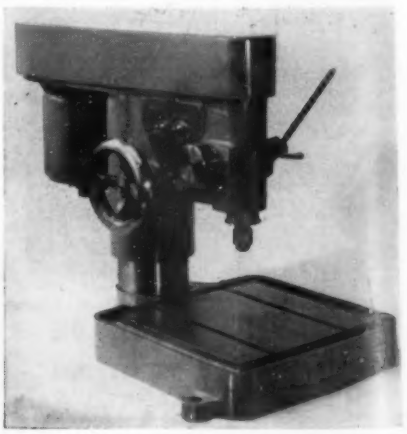
The unit is made by The Lincoln Electric Co., Cleveland, Ohio. **T-12-1152**

Precision Bench Drill

A series of "Precis" precision bench drills has just been introduced in this country by FASMA, Inc., 2 Park Ave., New York 16, N. Y. These bench drills have a capacity of ¼, ⅜ and ½ inch, with 8 speeds each and going up to 18,000, 9,000 and 5,000 rpm, respectively. Eight lower speeds for tapping are provided.

Precision built, the drilling head weight is counterbalanced by loaded springs for easy up-and-down settings on the column. The head also rotates left or right, locking either way by means of levers on the right-hand side. The spindle down movement is spring loaded; the pressure is adjustable and a precision stop is provided.

A built-in light illuminates the work area. Weight of a ⅜-inch capacity drill is 195 lb. **T-12-1161**



Power Units

Two models of lightweight gas turbine auxiliary power units have been developed by AiResearch Mfg. Co., Los Angeles, Calif.

One of the gas turbines is a compressed air supply unit with a weight of 170 pounds and an output rating of roughly the equivalent of 170 hp. The other is a combination compressor and shaft power unit from which both types of power can be extracted simultaneously. It is in the 120 hp class.

Outstanding feature of the new gas turbines is the complete enclosure of the hot parts of the turbine and nozzle box in a pressurized chamber. This "cool skin" feature avoids a major design problem and represents an important step in improved fire safety.

Should the outer skin of the gas turbine be pierced by a projectile or cracks due to vibration, the leakage consists of compressed air at the heat of compression rather than hot gases at combustion temperatures.

Although design of these turbines has been simplified by the elimination of stainless steel and aluminum enclosures, they remain full automatic self-contained units and in their workings are closely similar to units now in production at AiResearch.

Elimination of the metal envelopes on the new machines not only saved weight, but increased the machines' versatility of installation in aircraft. Simplification of the enclosure has the further value of reducing operational difficulties stemming from vapor lock and makes for greater ease of maintenance.

Another feature of the designs is the use of a single combustion chamber which eliminates dual ignition and any need for cross-firing means or fuel flow equalizers.

The arrangement of the combustor is such that the removal of a single clamp permits immediate withdrawal of the flame tube and inspection of the turbine nozzles.

According to the makers, this type of auxiliary service is primarily for making the airplane self-contained by providing power on the ground when the main engines are inoperative or for relatively short portions of the flight plan which render the fuel consumption issue of secondary importance.

Details of the new machines were given in a paper read recently before the power plant technical session of the SAE National Aeronautic Meeting.

T-12-1171

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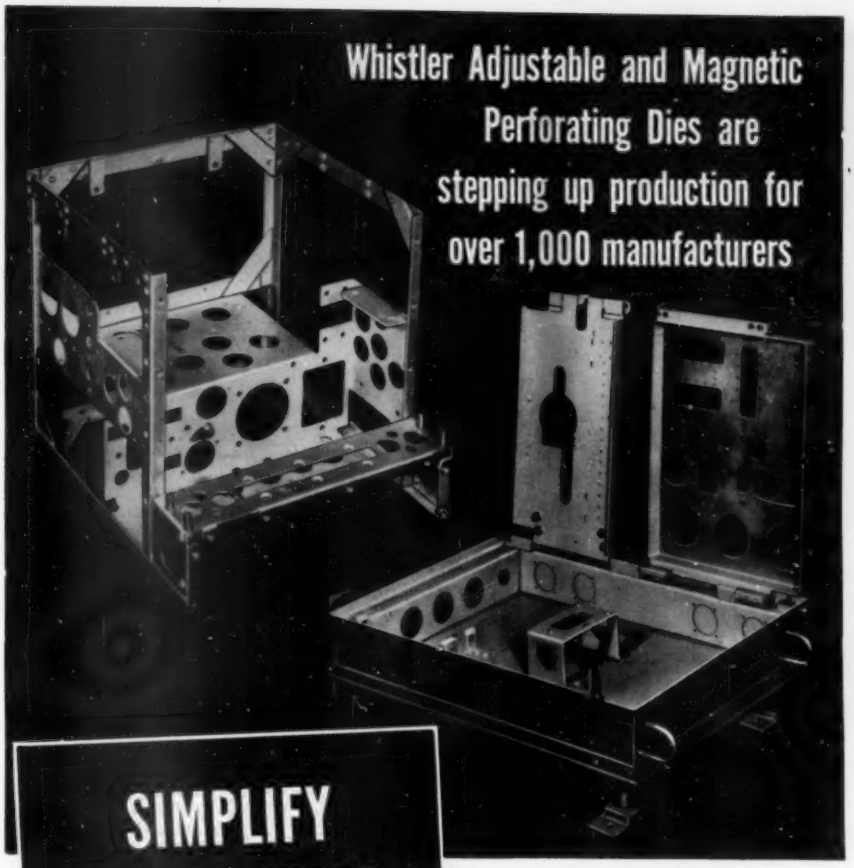
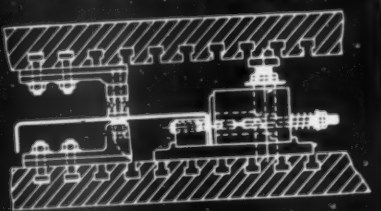
Whistler Adjustable and Magnetic Perforating Dies are stepping up production for over 1,000 manufacturers



SIMPLIFY COMPLICATED PIERCING OPERATIONS



Use this HU-50 90° Perforating Unit on the same job with other Whistler Dies ...often saves extra press operations.

USE WHISTLER Adjustable and Magnetic Dies for perforating, notching and slotting sheet metals ... fast, accurate and cost cutting. Complicated patterns can be set up quickly. Hole arrangements can be changed in the press...without waiting and at no extra cost. New HU-50 units, that pierce at 90° angle, can be used in conjunction with standard perforating equipment. Fewer press operations are necessary.

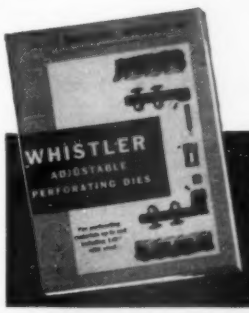
Re-use the same dies in different arrangements on many jobs. Punches and dies are interchangeable.

Whistler Adjustable Dies can be used in practically every type press. Standard sizes and shapes of punches and dies available up to 3 inches. Special sizes and shapes to order.

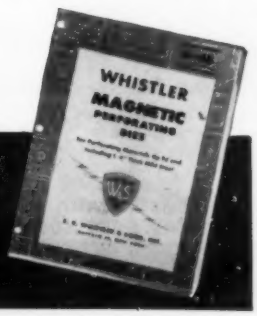
S. B. WHISTLER & SONS, Inc.

744 Military Road

Buffalo 23, New York



For prices and application data on this modern way to speed production and cut unit costs, write for these illustrated Whistler catalogs.



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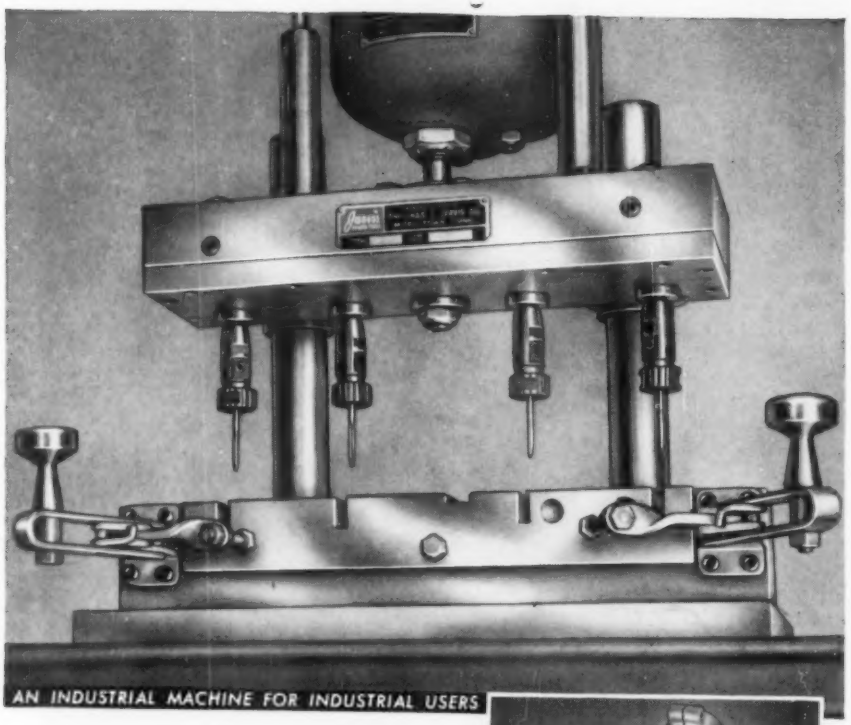
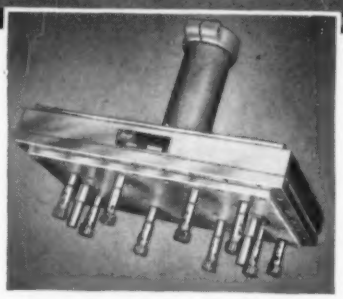


AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

For Multiple Tapping and Drilling . . .



Jarvis

MULTI-TAPPERS

Engineered and built to your specific production requirements from our basic standard components, Jarvis Multi-Tappers can be furnished for any type of drill press available.

We invite your inquiries—let us assist in analyzing your tapping and drilling needs!

Send for our catalog featuring Jarvis Multi-tappers

NEW FEATURES OF JARVIS MULTI-TAPPERS *include:*

- Aluminum case—Jig bored.
- Gear driven—positive action, silent drive.
- Ball bearings throughout.

WHEN POWERED WITH A JARVIS TORQOMATIC DRIVE THE JARVIS MULTI-TAPPER PROVIDES THE MOST EFFICIENT AND PRODUCTIVE MACHINE IN THE FIELD.

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

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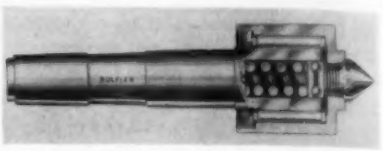
Live Center

A spring loaded live center has been placed on the market by The Bultool Co., P. O. Box 5094, Southfield Station, Detroit, Mich. Special feature of the tool is the super-precision preloaded journal bearings which permit high loading capacities while sustaining maximum rigidity. The high-speed steel tool point, ground under loading in its own bearing, maintains a concentricity of 0.0003 in. total indicator reading.

Known as Bulflex, Model FHH, the tool is heavy-duty built to withstand extremely heavy radial loads; and even knurling against the Bulflex does not



disturb its accuracy. This same feature insures reduced loading time per piece since no delicate adjustment of center is required.

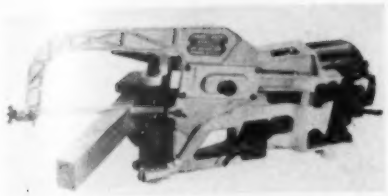
Breakage or early bearing failure, due to uncontrolled end thrust resulting from heat expansion of work at high cutting speeds or excessive pressure from tailstock screw, are avoided because of the scientifically proportioned massive roller journal bearings. These radial bearings take no thrust load and thrust bearings are spring loaded. Always solidly pressed against the work, the Bulflex is permanently chatter-free. Further, it can be shifted indiscriminately between heavy lathe turning and high precision cylindrical grinding and is said to consistently produce accuracies of 0.0000 to 0.0003 in. total runout.

The Bulflex-FHH requires no lubrication; an oil seal at the back of the head protects it from chips, dust, scale and coolants. **T-12-1181**

Power Hack Saw

Hand-I-Hack, a 50-pound portable power hack saw, manufactured by Lipe-Rollway Corp., Emerson Ave., Syracuse, N.Y., cuts in any position, metal, plastic or fiber stock of 3 inches or less in diameter at any angle from 45 to 90 degrees. Besides having an ordinary hack saw's advantages, this saw always cuts accurately and consistently saves time and labor.

An unusual principle, whereby the saw blade draw cuts and then lifts on its return stroke, eliminates the necessity for weights. This design enables the saw to be operated vertically, horizontally or even upside down. With its work vise clamped to a stanchion or a pipe, the Hand-I-Hack is self-support-



ing, ready to make repeated cuts within a tolerance of 0.010-inch square.

The saw frame is lightweight, corrosion-proofed cast aluminum alloy. Sawing pressure is regulated entirely by a knurled screw on the side of this frame where adjustments in cutting pressure can be made from extremely light cutting pressure for cutting thin tubing and other soft materials to pressure sufficiently heavy to handle solid steel.

Operation is fully automatic, shutting itself off after completing a cut. Saw blade speed is 115 strokes per minute, without load. **T-12-1182**

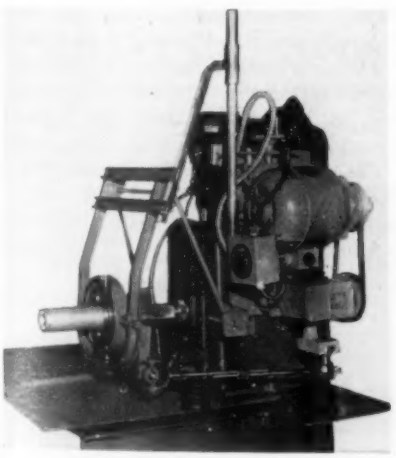
Honing Attachment

A low-priced automatic stroking and timing attachment for converting manually operated honing machines into completely automatic units has been developed by National Pioneer Co., 1134 Nebraska Ave., Toledo, Ohio. Manufacturer's tests show that with this attachment an operator can add 1/3 to his manual production on a single machine or he can run several machines at the same time, depending on the work cycle.

Even spherical honing, previously impractical, may be considered in economical manufacture plans because of a special automatic stroking attachment.

Standard attachments are available for practically all horizontal honing machines, including Sunnen, Ammco and Superior, and special attachments can be supplied to order.

A brochure describing this attachment is available from the company. **T-12-1191**



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Send for complete Tap Catalog now—also name of your nearest Jarvis representative.

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-119

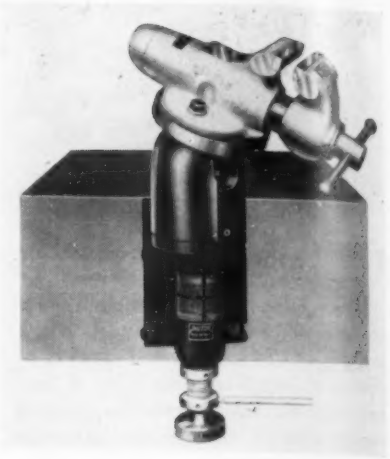
Hydraulic Positioner

Carrying capacity of 1000 pounds is possible with the heavy-duty hydraulic PowRarm recently introduced by The Wilton Tool Mfg. Co., 925-941 Wrightwood Ave., Chicago 14, Ill.

Other Wilton PowRarm Positioners are already being used as fixtures for many production or assembly operations. They provide production operators with a second pair of hands by supporting the work firmly in any position.

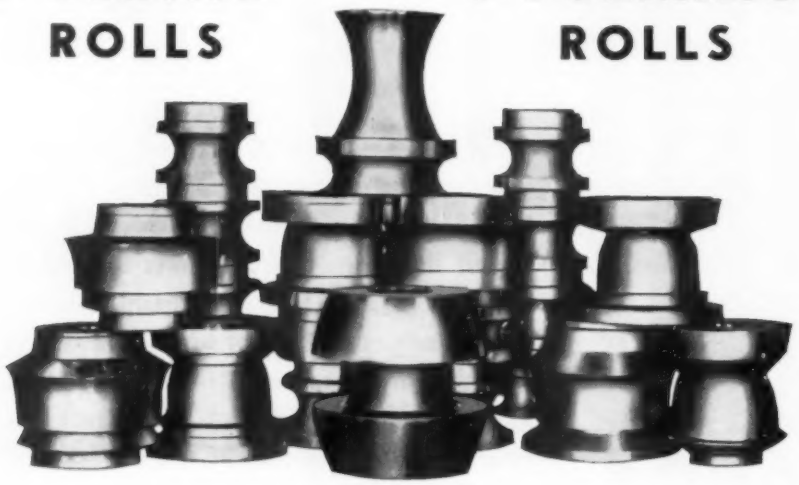
This model increases maximum might limits 700 percent over regular PowRarm units.

Particular advantages are foreseen by its use in foundries for positioning large castings for filing and chipping. It may be used vertically, as illustrated, mounted to the side of a workbench, or horizontally. There is a slotted base for use with drill presses, shapers, and milling machines for machining operations at compound angles. Its hydraulic action permits an operator to make a change of position under partial tension, to prevent work from accidentally falling and consequent damage.



Blueprints, as well as a 28-page catalog illustrating the Wilton PowRarm and other industrial clamping tools is available upon request. **T-12-1201**

▶ TUBING ROLLS ▶ FORMING ROLLS



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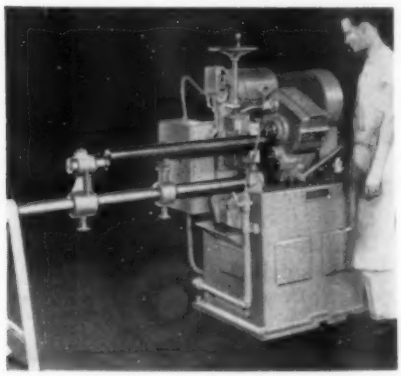
Milling-Centering Machine

Simplicity and speed of adjustment which make it ideal for the steel room or lathe department for miscellaneous shaft work are the outstanding characteristics of this Centrmil milling and centering machine.

After shaft has been located and clamped, the rocker-type milling head



mills one end. The milled end is then manually centered with a ¾-inch (max.) center drill. After this the part is reversed and located from center or end previously machined for milling and centering the opposite end. Power feed to the center drill and power clamping can be provided if desired.

The unit, made by Sundstrand Machine Tool Co., Rockford, Ill., takes work from ¾ to 3½ inches in diameter by 5 to 48 inches long. **T-12-1202**

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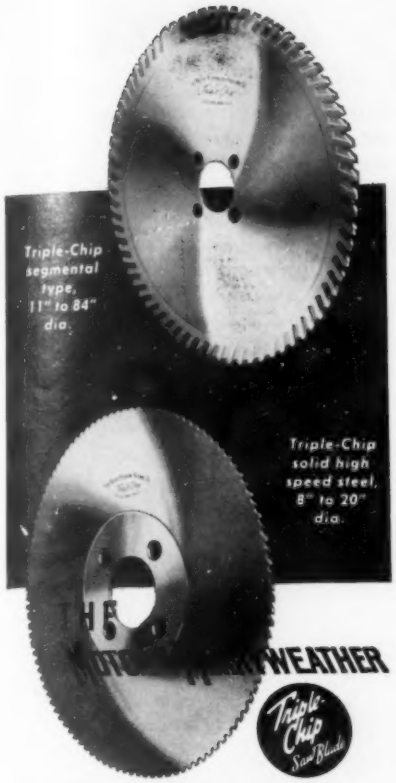

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Fast, burrless cut-off of shapes and tubes up to 30" round. Let M & M Triple-Chip saw blades give you the higher *production-with-accuracy* which Industry must attain and maintain. Ask your dealer.

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Cutting Tool Manufacturing Division

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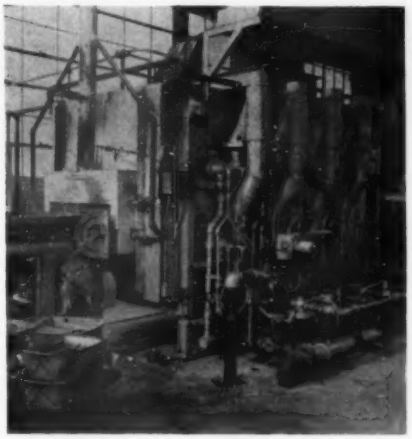
Only M & M builds ALL 3: CIRCULAR SAW BLADES, BLADE GRINDER

INDICATE A-12-121-1

Shaker Hearth Furnace

Small light weight parts now can be continuously hardened in a radiant tube, gas-fired shaker hearth furnace available from the Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa. With a maximum operating temperature of 1700 F, the furnace is designed for heat treating medium-carbon, high carbon and alloy steels without scale or decarburization in an Endogas atmosphere.

In operation, work is loaded on the hearth at the front of the furnace and the reciprocal motion of the shaker charger conveys the parts through the heating chamber until they fall off the discharge end of the hearth into the quenching fluid. Parts are then automatically conveyed from the quench



tank on a mesh belt and discharge into tote baskets. The shaker mechanism is mounted on a separate stand so that the furnace receives no shock from the oscillation of the hearth.

Estimated production for this furnace at 1600 F operating temperature, is 400 to 600 lb per hour. Speed of the work through the furnace is adjusted by varying the operating ratio of the speed reducer which, in turn, alters the frequency of oscillation of the hearth.

Charge space of the furnace's hardening zone is 30 x 84 in. and 3 in. high. Radiant tubes are installed over and under the shaker hearth and are fired from the same side of the furnace. It also can be supplied with electrical heating elements for installation where that type of power is more readily available. **T-12-1211**

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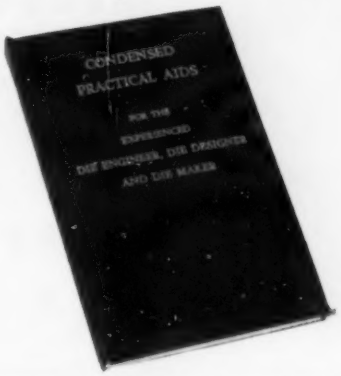
Here is the DIE BOOK you've always wanted!



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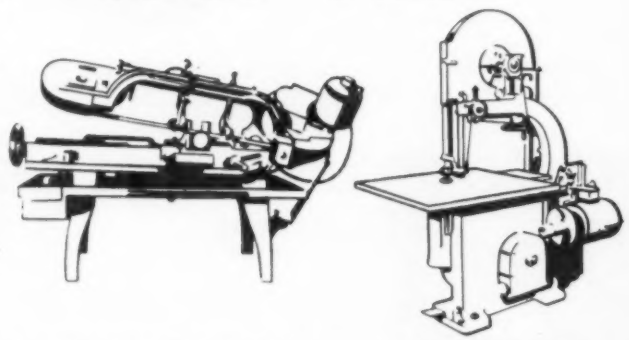
INDICATE A-12-121-2

Here's another

MILFORD METAL CUTTING FIRST

THE NEW MILFORD REZISTOR HIGH SPEED STEEL BAND TOOL



A REVOLUTIONARY, NEW, HIGH SPEED STEEL CUT-OFF TOOL DESIGNED SPECIFICALLY FOR CUTTING STAINLESS, DIE STEELS AND OTHER TOUGH FERROUS ALLOYS FASTER, MORE ECONOMICALLY.

- ***CUTS TWICE AS FAST . . .*** *as conventional carbon steel band saw blades when sawing tough alloys.*
- ***CUTS UP TO 30 TIMES LONGER . . .*** *as proved by actual, on-the-job tests in the field.*

Now a band saw machine can be used for cutting steels that heretofore could be cut only with a power hack saw blade. The MILFORD REZISTOR Band Tool cuts smoother, faster and more accurately — chip loss of expensive metal is reduced. Descriptive circular and price lists available. Contact us direct or through your local MILFORD distributor.

MILFORD specialists will talk over your metal-cutting problems with you, advise if the REZISTOR Band Saw Tool is right for your specific application, and determine your possible cost reduction.

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HAND AND POWER HACK SAW BLADES

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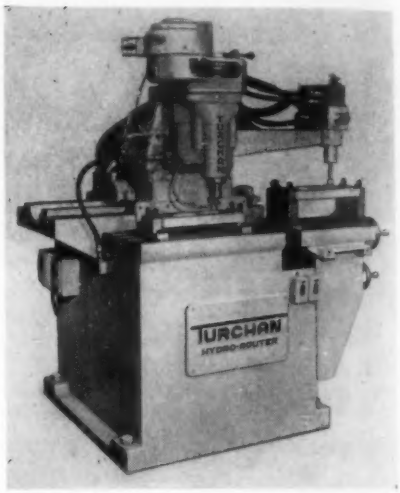
THE HENRY G. THOMPSON & SON CO. MILFORD REZISTOR #30 HIGH SPEED STEEL BAND TOOL

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-122

Automatic Router

Turchan Follower Machine Co., 8259 Livernois Ave., Detroit 4, is marketing an automatic tracer controlled milling and routing machine, built to perform difficult jobs faster at extreme accuracies. The Turchan Hydro-Router adapts quickly and easily to change-overs. Its finger-tip operation is accomplished through hydraulic tracer servo-control, providing effortless and accurate positioning of vertical spindle slide, ram, and ram slide, whereby the tool reproduces the same form as dictated by tracer stylus in contact with master.

All hydraulic feeds are of infinitely variable feed rates with stepless automatic tracer control, producing a consistently superior surface finish.



The stationary work table is attached to a sturdy machine base, thus eliminating vibrations and inaccuracies due to table overhang or twist under heavy load. The accurately adjustable master table has controls within easy reach. Micrometer dials reading in 0.001 inch facilitate setups and rapid, efficient handling.

Standard equipment for the units includes: three dimensional tracer-control; coolant tank with pump, motor and piping; splash and chip guard; cutter adapter draw bar; hydraulic power unit; and complete motor controls.

Turchan Hydro-Routers can also be built to specifications to meet any special requirements. Write Dept. TE. Turchan Follower Machine Co..

T-12-1221

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

It isn't

Projection Welder

The Sciaky EPT 2 machine has been introduced by Sciaky Bros., Inc., 4915 W. 67th St., Chicago, Ill., as one of a series of three-phase projection welders available in 50, 75 and 100 kva at 50 percent duty cycle. The unit is made in 12, 18, and 24-inch throat depths and maximum electrode force of 4,000 lbs. It also can be supplied as a combination projection and spot welder.

The combination welder, known as the ESPT, is designed to make high quality spot welds on large production runs on two thicknesses of clean mild

steel in minimum gages of 0.020 inch, and maximum gages of 0.203 inch. The ESPT 2 will spot weld two thicknesses of stainless steel in minimum gages of 0.022 inch and maximum gages of 0.125 inch. It also will spot weld aluminum and other light alloys (to commercial standards only), minimum gages of 0.025 inch and maximum gages of 0.102 inch.

These machines may also be used to weld many other types of materials and alloys, such as brass, Everdur, heat resistant alloys, coated steel, etc., within the limits of electrode force and secondary current. **T-12-1231**

Microammeter

A 269-Volt-Ohm-Microammeter is offered by the Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill., as one of the most compact, ultra-high sensitivity instruments available on the commercial market. Sensitivity of the instrument is 100,000 ohms per volt. Its 33 ranges have each been customized to meet the needs of the electronic and electrical industries.

This model features an easy-to-read, large 7-inch dial in a small compact case. To save time and assure accuracy, Model 269 has only two controls: one for setting the range desired, the other for easy ohms adjustment. Measurement accuracy is 3 percent dc and 5 percent ac of full-scale deflection.

Another feature of the unit is a Simpson Adjust-A-View handle, which may be used to support the instrument at a convenient viewing angle on a bench top. **T-12-1232**

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with the NEWEST DEVELOPMENT in . . .

Hitch Feeds!

New 2½" Model K Hitch Feed

FIRST

NO OTHER FEED — AT ANY PRICE — OFFERS ALL THESE PRODUCTION INCREASING ADVANTAGES!

NEW MEEHANITE CASTINGS
Massive frame of virtually indestructible meehanite makes the new Model K the strongest hitch feed ever built.

LONGER FEED LENGTH
Extra frame strength allows full 2½" feed length on stock up to 5" in width.

CARBIDE GRIPPER PLATES
Carbide gripper and wear plates are standard on this new, rugged, versatile feed.

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H. E. DICKERMAN MFG. CO.

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It isn't KENDEX* unless it's KENNAMETAL*

KENDEX* is the Registered Trade-Mark of Kendex Tools which are made exclusively by Kennametal Inc.

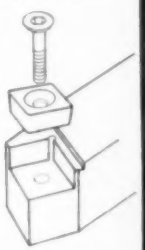
Kendex tools feature a precision-ground, multiple-edge, screw-mounted, indexable Kennametal insert that needs no regrinding. When the insert's multiple cutting edges become dull, to throw it away is economical practice. Replacement cost is slight compared to that of regrinds.

Kendex tooling minimizes downtime for tool changing, eliminates tool grinding expense, and ends the false economy of reconditioning tools that have outlived their usefulness. Ask your nearest Kennametal representative for details. Kennametal Inc., Latrobe, Pa.

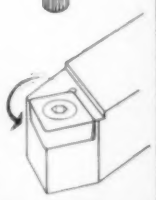
*Registered Trade-Marks

How KENDEX* Works

1 Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.



2 Kendex inserts are mounted to suitable tool holders with socket head screws.

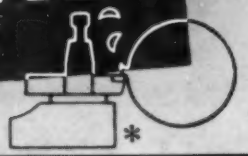


3 When edge becomes dull, insert is turned to new cutting position. When all cutting edges have been used, insert is thrown away; no regrinding.

KENNAMETAL*

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY

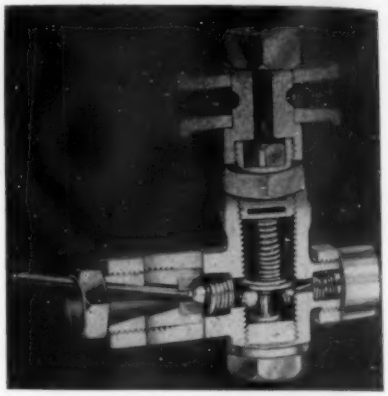
SALES OFFICES IN PRINCIPAL CITIES



Air Valve

Because of its unusual operating principle, all-metal construction, and flexibility of both mounting and application, the Wobble-Rod valve introduced by Pantex Mfg. Co., 521 Roosevelt Ave., Pawtucket, R. I., offers new possibilities to designers and users of pneumatically operated equipment.

The lever which opens and closes the valve is a hardened rod so swivelled that the free end can move vertically, laterally, diagonally or in arcs and circles. Accordingly, the valve, which can be actuated manually, mechanically, or electrically by all manner of motions, allows lateral play during a vertical throw; permits direct linkage to rotating, oscillating, toggle, lever, slot, or straight thrust mechanisms; can



be adapted to cyclic operation by merely passing the lever-rod through an eccentric hole in a rotating disc or gear; and is easily spring loaded to remain normally open rather than closed.

Its internal exhaust valve will automatically discharge an air cylinder, line or receiver when the valve closes, but can be eliminated where it is desirable to hold air-line pressures after the valve has done its job. Another integral feature is a check valve (ahead of the ball-and-seat) to prevent back-surge.

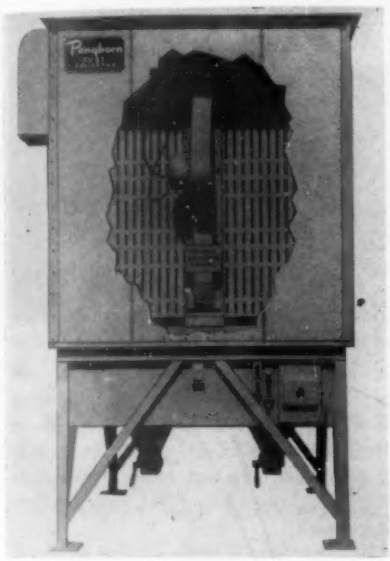
The body casting is designed to permit two valves to be assembled into one unit. Such arrangements can provide a common inlet, a common outlet, simple series connection, or total independence of the two valves.

Construction of the unit is entirely of noncorrosive metals; there are no rubber or fiber seats or diaphragms; mating parts are designed to seal without gaskets or packing, and are threaded together without bolts or flanges; and dissimilar metals are used at all friction points to prevent galling and reduce operating forces. All springs are of the compression type to insure safe operation in the event of spring failure. **T-12-1241**

Dust Collector

Continuous automatic dust collection, constant air volume and suction, and positive reverse flow filter cleaning, with a consequent lowered operating and maintenance cost, are among the advantages claimed for the Pangborn type CH-3 self-cleaning cloth screen dust collector, made by Pangborn Corp., Hagerstown, Md.

The CH-3 collector uses the principle of reverse air flow for continuous cleaning of its cloth filters. This is accomplished by action of a traveling manifold whose integral reverse air



blowers take its air directly from the clean air side of the collector.

In operation, the manifold covers three vertical rows of cloth-covered screen frames at one time. The reverse flow of air is blown through the center row of screens while normal air flow through the other rows is blocked off. The blocking action is accomplished by the flexible diaphragm on the manifold which is inflated against the grid wall under flow of pressure when the blower unit is centered on a particular row.

This mechanical arrangement causes the dust to be blown from all external surfaces of the filter elements and allows it to drop into the hopper instead of being re-entrained. This arrangement also prevents air short circuiting. The blower motor in the traveling manifold is interlocked with the main exhauster motor to insure simultaneous operation. **T-12-1251**

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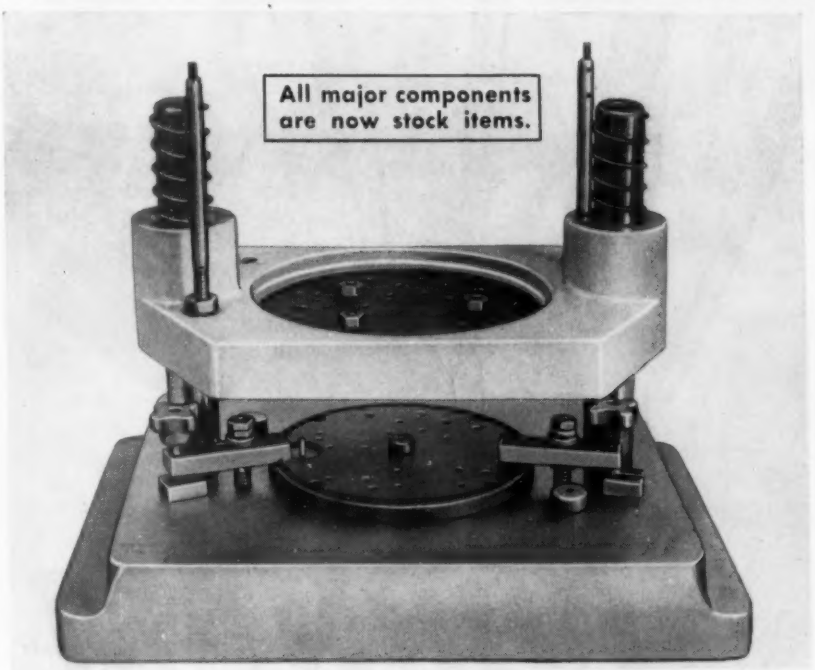
HERE'S THE NEW Zagar
Standardized Self-Clamping DRILL JIG

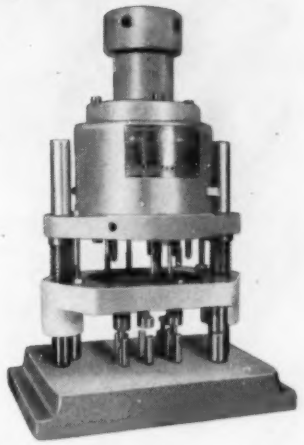


Zagar Drill Jigs are used in conjunction with Zagar gearless multiple-spindle drill heads to ream, drill and tap on standard drill presses and tapping machines.

NOTHING ELSE LIKE IT!

4 TYPES — 9 SIZES,
5 COMBINATIONS PER SIZE —
Hole Patterns 3" through 15" Dia.

SPEEDY — ACCURATE — RUGGED



▲ Zagar 15-spindle, 7" diameter gearless drill head mounted on Zagar standardized drill jig drills 15 holes in aircraft part.

A new concept to reach new production highs! Standardization means quick delivery and attractive price, since only a very few minor parts have to be made. Extremely fast; the operator merely feeds the parts — the Zagar Self-clamping Drill Jig does the rest. Proven design insures maximum accuracy.

ASK FOR OUR NEW DATA SHEET "E-12".

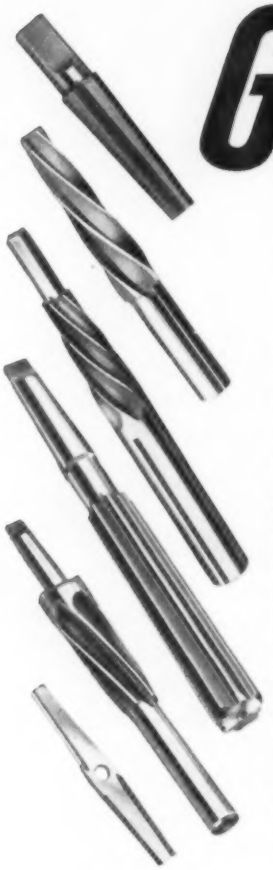
ZAGAR TOOL, INC. 24000 LAKELAND BLVD., CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-125

FOR SPECIAL REAMERS . . . REMEMBER

GORHAM



They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14407 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-126

Portable Grinder

An electric mountable handtool is said to have power and precision to operate tungsten carbide midget mills, as well as other rotary tools for grinding, milling, finishing and polishing with a range from 3/32 to 3/16 of an inch in shank diameter.

Driven by 1/5 hp universal motor, the one-piece dynamically and statically balanced spindle turns at 45,000 rpm. Speed control reduces the rpm in stages to 15,000. The collet chuck is a precision draw-type honed collet. Only one hexwrench, applied at top end of tool, is required to open and close chuck.

The unit, known as the Precise Super 30, is air-cooled and absolutely vibra-

tionless. The spindle turns on two micro precision ball bearings which have lubricant sealed in for life. Motor is protected against overload by built-in fusetron and two automatic brush stops shut off power when brushes need replacement.

Precise wheel arbors are available for precision internal grinding and milling with rotary tools such as unmounted grinding wheels or tungsten carbide Micro Mills. Arbor sizes include ⅛, 3/16 and ¼ inch.

The tool lies flat when not in use. All mounting surfaces are precision machined to insure accurate concentric mounting on standard lathes, milling machines, drill presses and other available machine tools. Specially designed Precise mounts and other accessories are available from the maker, Precise Products Co., 1328-30 Clark St., Racine, Wis. **T-12-1261**

Bearings

A line of spherical bearings and spherical rod end bearings, introduced by Lincoln Park Industries, Inc., 1719 Ferris Ave., Lincoln Park 25, Mich., is now supplied in different sizes and types to cover many applications.

Known as Adjusta-Ball bearings, they provide a means to adjust the ball race to provide accurate positioning of the bearing, thus assuring not only maximum correction of misalignment, but also a greater service life of the bearing since proper adjustments can

Wire and Ribbon Metal

FORMING MACHINES

Mounting production costs are driving firms out of the competitive picture. Too much scrap metal! Too many single operation machines! Too many operators! This whole picture can be changed to a highly profitable operation.

Install a NILSON combination press and 4-Slide forming machine. This machine takes wire or ribbon metal directly from the coil, straightens, feeds, pierces, blanks, swages, stamps, or coins, cuts off and forms . . . automatically in one quick precise operation. See the new picture? . . . Increased production! Minimum scrap metal! One machine for all operations! One operator!

For specific recommendations . . . send details of your operation.

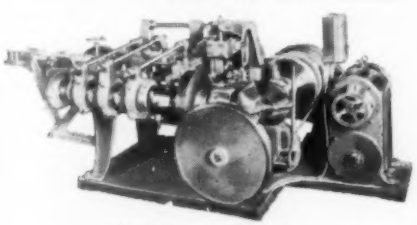
NILSON

NILSON has been specializing in Forming Equipment for over 50 years.

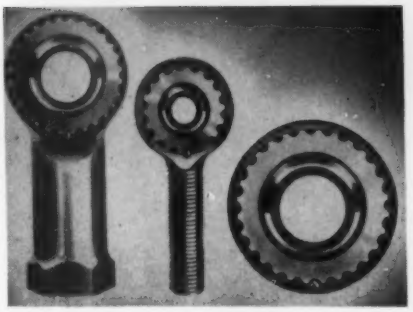
THE A. H. NILSON MACHINE COMPANY

1520 RAILROAD AVENUE • BRIDGEPORT 5, CONN.

CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • HAMILTON, ONT., CANADA



INDICATE A-12-127-1



be made to compensate for wear.

Each bearing race insert is so designed that it may be adjusted to any desired degree of relationship to the ball. By the use of a spanner wrench inserted in the notches on the outer edge, the race can be tightened or loosened with a one-notch adjustment being slightly less than 0.001 inch. Once the adjustment is made the bearing race inserts are locked firmly in position by means of a set screw inserted through the notch which is at the bottom position.

All Adjusta-Ball bearings are prelubricated. Lubrication is supplied through the stem in rod end bearings and through lubrication holes in the spherical bearings. An opening between the two bearing race inserts acts as a reservoir to provide an adequate supply of lubricant at all times. When specified, the bearings can be supplied with seals to hold the lubrication in the body of the bearings. **T-12-1262**

Solenoid Valve

Only two moving parts are involved in the rugged, compact stainless steel solenoid valve recently introduced by The Skinner Electric Valve Div. of the Skinner Chuck Co., New Britain, Conn. Designated Series V61, this "cutoff" type valve features "snap-shut" action and absolute, bubble-tight sealing.

It is equally adaptable to factory installation or fast, easy installation in the field. The valve can be disassembled and serviced without removal from the line. A heavy spring return assures positive shut-off regardless of the valve's position. Operating dependability is assured under conditions of extreme vibration, high temperature, high humidity, and low voltage.

V61 valves can be readily modified to meet special requirements, and are already being offered with a built-in check valve to prevent back flow between the two tanks of a double tank system.

Complete technical data, prices, and information about specific applications may be obtained from the Division, Edgewood Ave., New Britain, Conn.

T-12-1271

There's a husky Dependable GRAYMILLS Coolant Pump or complete unit for ALL Machine Tools

CENTRIFUGALS
for high volume
1 to 72 G. P. M.
1/25 1/8 1/4
1/2 H. P.

GEAR PUMPS
for high pressures
up to 100 P. S. I.
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TANK CAPACITIES
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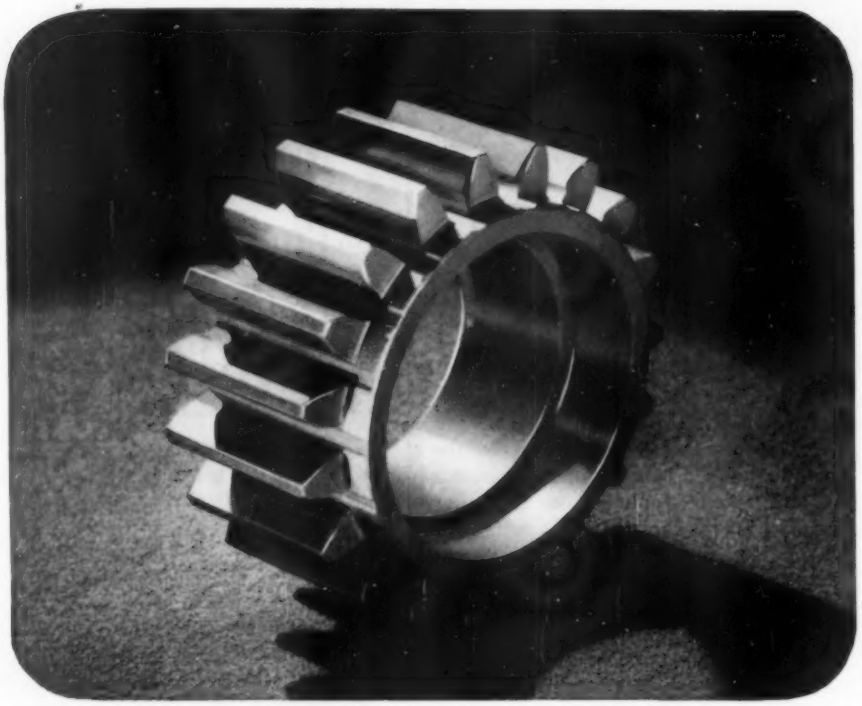
INDICATE A-12-127-2



IN ONLY 3½ DAYS

"PUTTIN'-ON-TOOL"

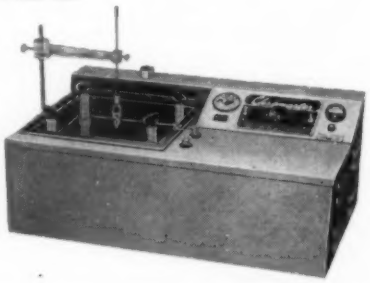
saves leading press manufacturer $2100 on spur gears

The bore diameter of flame-hardened precision gears like the one above used to be a costly problem for R. Hoe & Co., Inc., one of the leading manufacturers of large newspaper presses.

Constant orders for this particular gear, each specifying the bore diameter to extremely close tolerances, had to be met. Since manufacturing costs exceed $26.00 per gear, neither making up specials—nor annealing, reboring, and rehardening—was an economical solution. What HOE needed was a "puttin'-on-tool."

That's exactly what they have in their new Chromaster Industrial Chrome Plating Unit, which they use to adjust the bore diameter of stock gears to specification. Recently in a 3½ day period they were able to plate 81 of these gears with chrome deposits ranging from .0002" to .005" at a saving of $2100.

Chromaster can save you money, too. Write us.



CHROMASTER SALVAGES undersized parts, worn tools and gages right in your own shop. It's so simple to operate that no previous plating experience is needed. The chemically stable plating solution is deposited at a rate of .002" per hour for a cost of 7 mils per sq. in. One of six models will meet the requirements of every shop.

Chromaster

Industrial Chrome Plating Units 20, 50, 150, 250, 500 and 1000 amp. units

Ward Leonard Electric Co.
Industrial Chrome Division
15 South Street,
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Please send me information on industrial chrome plating with CHROMASTER.

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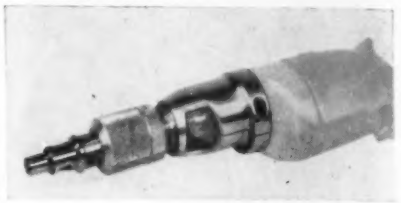
Sine Adjustable Guide

An unusual device, the Sine adjustable drill guide, adaptable to either portable power tools or drill presses, has a depth stop that can be adjusted to any desired depth from ¾ inch on hand tools to 1¼-inch depth when mounted on a drill press.

It is a valuable tool in the fabrication of aircraft and similar assemblies, where large numbers of small diameter holes are to be drilled. With the attachment it is not necessary to use drill bushings in the jig plates, as the pilot is designed to accept the desired drill size and thus takes the place of the bushing. The jig plate may then be made of cold rolled or fabricated steel or plastic, with reamed holes to accept the pilot tip, thereby reducing the cost of the drill jig. Drill breakage is reduced to a minimum, as the drill is running inside the pilot when entering any hole



in the jig plate. As pressure is applied to the drill motor, the pilot slides into the body housing bushing, allowing the drill to enter the stock. The pilot is designed so that it does not turn with the drill, and thus minimizes the bushing wear.

To drill out improperly formed round or universal head rivets, the pilot has been made with an inside chamfer that facilitates location of the drill on the rivet center. With an outside chamfer the attachment may be used for centering holes in a countersink, such as butt doors, hinges, etc.

The guide was designed primarily for use with various size drill motors from ¼ inch up, such as the Black & Decker Holtgun, but is adaptable also for use with drill presses. It comes in 4 different sizes—No. 1, No. 2, No. 3, and No. 3A. Many attachments of similar design are now being used in the aircraft industry. None, however, have a suitable depth stop coupled with a nonrotating pilot, nor is any other such tool suitable for the removal of defective rivets.

A prime feature of the guide is the versatility of its removable tip; it is nonrotating, thereby avoiding a cause of early wear; the tip is of sufficient length to insure usability in drill jigs and plates of almost any thickness; with the properly reamed jig hole, the tip OD

MEASURE IN MICROINCHES

Are you interested in saving up to 50% in your inspection time, also extending for many years the useful life of expensive gage blocks?

The above is being accomplished in many of the largest manufacturing companies in the country by the use of the Pioneer Tool gage block jack.

•

Designers and manufacturers of tools, dies, gages, fixtures, special machines, optical checking equipment and precision instrumentation parts.

PIONEER TOOL & ENG. CO.
3914-18 W. Shakespeare Ave.
Chicago 47, Illinois
INDICATE A-12-129-1

sizes to suit, will insure a perfect 90-degree hole. It is interchangeable—one drill motor and one attachment can be used for drilling a number of various sized holes. These tips can be built to suit any special job or to customer's specifications.

The device is distributed by the E and E Engineering Co., 15023 Harper Ave., Detroit 24, Mich. **T-12-1281**

Tool Cooling

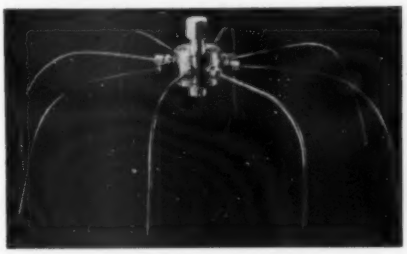
A laboratory and field tested Acro Lo-Jet coolant system is now in full production by the Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill. Its principle is based on the idea of cooling the tool, not the chip.

Designed to accommodate up to 16 cutting operations, the system is completely portable so that it can be moved to different operations or positions for changing work demands.

Considered especially effective on multiplying tool life, Lo-Jet also permits taking fuller cuts on any work. Further, in addition to its many mechanical production advantages, it also eliminates all of the objectionable odor, smoke and allergy problems of many lubrication methods. **T-12-1291**

Coolant is forced into a high velocity air stream with the cooling and lubricating unit above.

The mist is then directed to the tool through the centrifugal distributor, below, flexible high pressure tubing and nozzle.



USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

use STRIPS of abrasive at 1/4 the cost

End the bother and high cost of endless abrasive belts by using strips torn from standard economy rolls on . . .

CONE-LOC®
DRUM SANDERS

Many plants claim they save the entire cost of CONE-LOC DRUM SANDERS on the first 50 yards of abrasive used!

When the arbor nut is tightened down against locking cone the wheel becomes a perfectly balanced, smooth running drum . . . with no bounce at the joint. Can be re-headed with new abrasive strip in seconds. Can be used on either flexible shaft or stationary arbor.

- **SAFE** *at speeds up to 4000 R.P.M. (6¼" diameter)*
- **PRECISION BALANCED** *at operating speeds*
- **LIGHT WEIGHT** *Now made of new "high tensile" aluminum alloy.*

SATISFIED USERS who have RE-ORDERED: Enterprise Plating Works, Excello Corp., Caterpillar Tractor, Thompson Products, Chrysler Corp., Fisher Body, Remington Arms, and many others.

ORDER DIRECT for immediate delivery. If not satisfied, return within five days for full credit. Also available through all dealers of The Carborundum Company.

Standard RUBBER CUSHION Sizes

Diam.	Widths	Net. Wt. Lbs.	Delivered Price
6¼"	1"	1½	$24.75
6¼"	1½"	2	27.25
6¼"	2"	2¼	29.00
8 "	2"	3½	40.00
10 "	2"	6	48.00
12 "	2"	7½	58.50

Standard FELT CUSHION Sizes

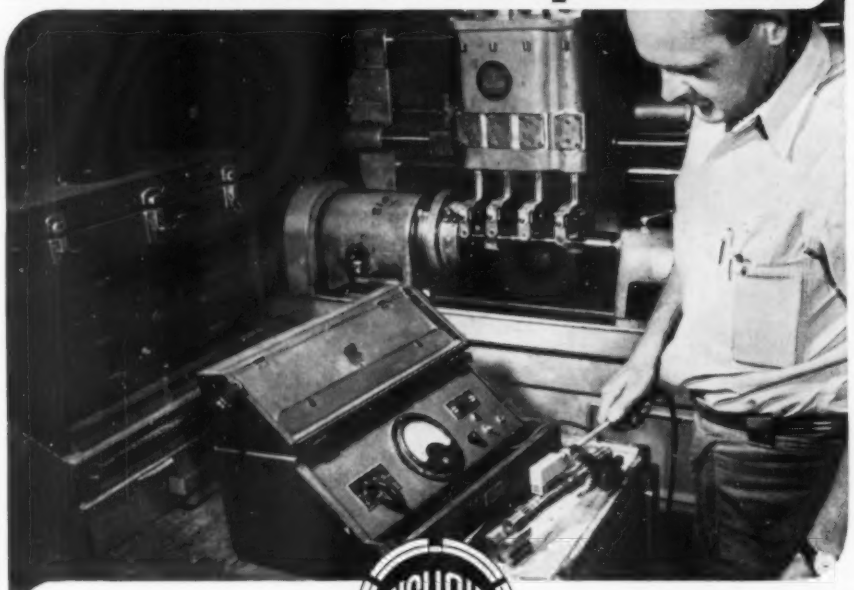
6¼"	1"	1¼	$21.00
6¼"	1½"	1¾	22.75
6¼"	2"	2	24.75

Specify arbor hole size—½" to 1¼"
ALL PRICES ARE **DELIVERED** YOUR PLANT

AMERICAN DIAMOND SAW SALES
120 N.W. Ninth Ave. Portland 9, Oregon
INDICATE A-12-129-2

MEASURE IN MICROINCHES

A Finish of 4 Microinches in Seconds with Superfinish



checked by GISHOLT with the PROFILOMETER

In Madison, Wisconsin, at the Gisholt Machine Company, every superfinishing machine is test checked with actual work samples before shipment to a customer.

For instance, take this Gisholt 51-A Superfinisher. Equipped with a special four-quill upper oscillating head and an automatic two speed operating cycle, four diameters are simultaneously Superfinished on Automatic Transmission Clutch Shafts. These clutch shafts are brought down from 30 microinches to 4 microinches in less than 53 seconds!

For positive assurance of the required surface finish on these shafts Gisholt relies on the Profilometer. Shown above in actual operation is the Profilometer checking surface finish only seconds away from the Superfinishing operation.

"The Profilometer has proven invaluable in checking surface finish performance quickly and accurately", says Gisholt.

Today, the Profilometer provides the fastest, simplest and most versatile means of obtaining in the shop dependable roughness ratings for all surfaces from a fraction of a microinch to 1000 microinches.

In your plant, too, the Profilometer can offer exceptional advantages as an all important shop tool.

To learn more about the Profilometer, write today for this free bulletin—"Practical Features and Applications of the PROFILOMETER."

Micrometrical field representatives, traveling throughout the United States, will be pleased to give you an actual demonstration of the Profilometer at your request.

Profilometer is a registered trade name.

MICROMETRICAL
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formerly PHYSICISTS RESEARCH COMPANY
Instrument Manufacturers

ANN ARBOR 6 MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-130

Abrasive File

An "abrasive file"—used like a conventional metal file, but with a cutting surface that feeds from a coated abrasive roll—has been announced by Monarch Machine Shop, Inc., Madison, Wis., and Minnesota Mining and Mfg. Co., St. Paul, Minn.

Called the "Red Flash" abrasive file, this hand tool is designed for deburring and other filing and finishing operations throughout the metalworking field. It is manufactured by the Monarch Co.

Featuring an 11-inch stroke, the file holds a roll of more than six feet of

abrasive cloth, providing a six-foot cutting surface that is dispensed as needed to provide a fresh surface and to maintain peak cutting efficiency at all times.

Other advantages claimed for the tool are faster cutting, increased versatility through a wide choice of abrasive grits, and greater economy, since only the cutting surface (rather than the entire file) is replaced when it becomes dull.

It is designed for use in all shops, such as machine, tool and die, sheet metal, and autobody shops, as well as by pattern makers and general purpose users.

The file comes in 1-inch and 1½-inch widths complete with a "Three-M-Ite" grit 80 abrasive cloth roll. **T-12-1301**

Surface-Angle Plate

A surface-angle plate combination has been developed by Rahn Granite Surface Plate Co. of 641 N. Western Ave., Dayton 7, Ohio. The combination is made to extreme precision which is lasting, due to the inherent stability of the black granite (diabase) used. This material has literally been heat-treated and normalized by nature for centuries. All internal stresses have been removed so that the precise angle designed into the unit will not become distorted.

The photograph shows a 24 x 36 x 6-inch blade granite surface plate with two 8 x 24-inch black granite surface plates attached to one edge. All three plates have been finished to a tolerance for flatness of 0.00005 inch.

T-12-1302

Consumable-Electrode Welder

Fillerarc welding equipment for the consumable-electrode gas-shielded welding process is offered by the General Electric Co. with the expectation of advancing the field of application of high-speed, high-current-density, gas-shielded welding which heretofore was dependent on the necessity of using existing welding generators not specifically designed for this process.

According to the makers, the high-speed metal deposition provided by Fillerarc apparatus enables the operator to more than double output on applications where filler metal must be added. In addition, the equipment simplifies control, decreases operator training time, and reduces operating and maintenance costs, the engineers said.

Electrode wire of aluminum, stainless steel, mild steel, copper, magnesium, and other alloys may be employed in the equipment with argon or helium shielding gas. The process can be used in down-hand, vertical, or overhead positions.

Equipment consists of three main components: a special self-regulating motor-generator type welder, a pistol-like holder, and an electronic wire-drive unit.

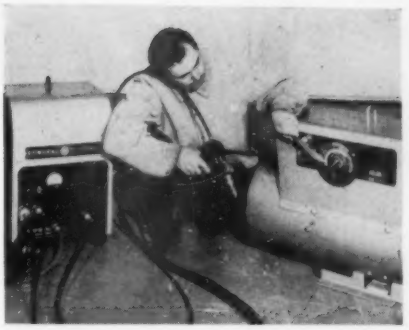
The Fillerarc welding generator, rated at 450 amperes continuously, has a rising volt-ampere characteristic. As current is produced by the welder, the voltage generated increases, making the process self-regulating.

Designed to give constant arc length, the new welder produces any current required up to its full rating. Once arc length is set, the operator can change wire feed even while welding, without the necessity of readjusting the welder.

The Fillerarc gun contains knurled feed rolls for pulling the electrode wire from a spool mounted in the wire drive unit, a trigger to control wire feed and gas flow, and an electrical contact tip. It is water cooled with a rating of 400 amp continuous d c. The gun is capable of feeding wire from 0.030 to 0.093 inch in diameter of aluminum, steel alloys, and other metals, with no special temper required.

Since the electrode wire is "pulled" instead of "pushed" through the gun, smaller diameter wire can be used with the equipment, increasing its range of application.

The wire-feed can be adjusted from 0 to 750 inches per minute by means of a remote two-speed switch, and the set speed is held constant by an electronic motor control in the wire drive



unit. Finger-tip control enables the operator to obtain gas coverage automatically before and after the arc is struck.

Operation of the Fillerarc gun is simple, G-E engineers explained. It is positioned, the trigger pulled to get preliminary gas coverage, then released to feed the wire. The arc is automatically started as the wire touches the work. Operating the trigger again stops the wire feed, and the gun is held in place over the work to provide gas coverage as the weld cools.

As the wire stops feeding, the arc current is reduced to zero, the generator voltage drops, and the arc goes out without burning back to the gun. Somewhat of a crater-filling action is created, G-E engineers said, which enables the operator to make continuous tack welds without raising his face shield, cutting off the wire, or making awkward starting or stopping motions.

More complete information about the unit and the process is available from the General Electric Co., Schenectady 5, N. Y. **T-12-1311**

Designed for. . . HIGHER PRODUCTION WITH GREATER ACCURACY AT LOWER COST PER PIECE MACHINED
Burgmaster
No. 2 — Model A
SIX SPINDLE TURRET TYPE POWER INDEXING DRILLING AND TAPPING MACHINE
. . . . will increase your production up to 30% thereby reducing your production cost!
Used by the leading aviation, industrial and automotive plants from coast to coast.
(Names available on request)
WRITE TODAY
For catalog and detailed information to:
BURG TOOL MANUFACTURING CO. DEPT. TE 12
3743 DURANGO AVENUE • LOS ANGELES 34, CALIFORNIA

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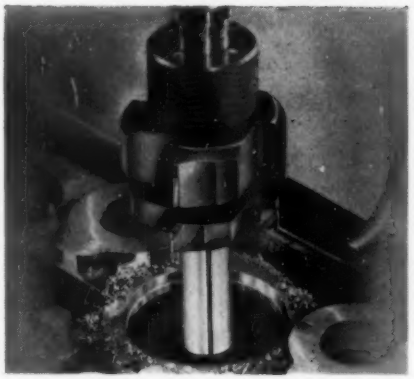
Boring Bar for Radials



Bore bars designed for use in any radial or multiple spindle drill press, have been introduced by Belock Instrument Corp., College Point, New York, N. Y. Among their prime features is that they enable finish boring operations to be done without leaving the one department, thus obviously avoiding unnecessary inter-department handling which naturally contributes substantially to an increase in production rate.

The standard line of bars will bore any diameter from 1.250 in. min. and to 5.812 in. max. If the casting is sufficiently cored, up to ½ in. of material can be cut at one time. Multiple bore bars which bore and counterbore in one operation also are available as standard to do any long step or short step combination. Rigid carbide cutting edges are provided and absolute concentricity is assured. Hardened and ground stop collars govern depth of cut and eliminate overrunning counterbore depths.

Simple pilot fixtures are used rather than jigs, and hardened and ground bushings used in the fixture accurately locate coordinate centers and give absolute uniformity in every casting set up in that fixture. **T-12-1321**

RETAIN CONTROL

with INSPECTION and CODE STAMPS

These inspection and code stamps enable a manufacturer to retain control of his product wherever it goes. A single glance can provide such information as the identity of a welder, inspector, operator, or assembler—heat number, lot number, material or date of manufacture.

Choose your own code from any of 300 stock designs, available in any desired size, in either the economical HI-DUTY Brand or the even longer-lasting HI-LOY Brand. You'll get permanent identication through use of code designs, with key letters or figures if desired.

"IF IT'S WORTH MAKING, IT'S WORTH MARKING" . . .

Geo. T. Schmidt marking engineers will help you develop a code control plan without obligation. Write for particulars.

GTS

GEO. T. SCHMIDT, INC.

4104 RAVENSWOOD AVE., CHICAGO 13, ILL.

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Bending Machine

An unusual bending machine, the Wallace No. 60, has been placed on the market by Wallace Supplies Mfg. Co., 1300 Diversey Pky, Chicago 14. Simply pulling the trigger switch of the drill press ¾ hp motor toggle switch, above the trigger switch, controls the forward or reverse rotation of the bend.

Several features attract attention: The bender is completely portable; it will bend from ½ to 1¼-inch ips pipe to 180 degrees; it averages 60 bends per hour with one man; and die forms can be quickly and easily changed for pipe sizes.

Limit switches are preset at the factory for 0 and 180-degree rotation of bending form to prevent the possibility of overtravel in either forward or reverse direction.

Further, the tool is designed to operate so that the machine can be placed anywhere along a length of pipe and then operated at that location, resulting in less handling of the pipe.

The main driving gear is case hardened and ground for maximum resistance to wear.

When not used as a portable tool, the bender can be mounted on a bench or clamped in a vise. **T-12-1322**

THE TOOL ENGINEER'S

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	DESCRIPTION
A-12-205	Atlas Press Co.	Lathes—A variety of illustrated literature describes the new construction, parts and features of the Clausing 5300 bench lathe. (Page 204-205)
A-12-181	Bethlehem Steel Co.	Tool Steel—Booklet 341 discusses the versatility, shock resistance, hot-work, easy machining and resistance to heat-treat distortion of Bearcat tool steel. (Page 181)
A-12-147	Brush Electronics Co.	Surface Control—New booklet offers suggestions for reducing surface finish costs by more efficient use of equipment and improved products. (Page 147)
A-12-23	The Carborundum Co.	Grinding Wheels—Grinding cemented carbides and maintenance of alloy and high-speed cutting tools are discussed with a cost-cutting angle in these two booklets. (Page 22-23)
A-12-33	The Cincinnati Shaper Co.	Shears—Free catalog S-6 explains the ability of Cincinnati shears to produce accurate draw die blanks. (Page 32-33)
A-12-169	Danly Machine Specialties, Inc.	Hydraulic Equipment—"Hydraulic Metalworking Equipment" bulletin gives complete data on hydraulically operated metal-piercing machines. (Page 169)
A-12-229	Delta Power Tool Div., Rockwell Mfg. Co.	Power Tools—Free catalog AB 52 explains the application of inexpensive power tools on production lines. (Page 229)
A-12-115-2	Drillunit, Inc.	Drill Mechanisms—Folder and data sheets describe the stroke capacity, feed rates and operation methods of hydraulically driven drilling attachment. (Page 115)
A-12-217	Edlund Machinery Co.	Drilling and Tapping Machines—Bulletin 140 gives complete specifications and description of single and multi-spindle drilling and tapping machines. (Page 217)
A-12-244-1	Galland Henning, Nopak Div.	Pilot Valves—Nopak Bulletin V gives application and construction data for air-operated pilot operated slide valves. (Page 244)
A-12-18	Gisholt Machine Co.	Elliptical Machining—Simplimatic catalog pictorially reports case histories of special elliptical machining problems. (Page 18)
A-12-19	Gisholt Machine Co.	Hydraulic Lathes—Application of hydraulic lathe No. 12 to military shell manufacture is presented in catalog. (Page 19)
A-12-20	Gisholt Machine Co.	Superfinish Attachments—Textbook available describes method of improving metal finish. General catalog discusses numerous Gisholt products. (Page 20)
A-12-168	Gorton Machine Co.	Tracers—Booklet "Pantography" explains the process of tracer-controlled Pantograph machine for metalworking. (Page 168)
A-12-157	Guthery Machine Tool Corp.	Automatic Screw Machines—New 32-page catalog describes nomenclature and operation of Traub automatic screw machines, turning and copying machines. (Page 157)
A-12-213	Hannifin Corp.	Riveters—Thirty-two-page book explains in detail the construction, applications and advantages of heavy and portable rivet machines. (Page 213)
A-12-243	Illinois Tool Works	Gear Inspection—Booklet "Analytical Gear Checking" gives diagrams and detailed technical data concerning gear inspection in large and small shops. (Page 243)

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LITERATURE NUMBER	COMPANY	DESCRIPTION
A-12-185	Kearney & Trecker Corp.	**Indexing Attachments**—Data Sheet 1008 describes the application and cost-cutting advantages of notch plate control indexing attachment. (Page 185)
A-12-8	Landis Machine Co.	**Threading Machines**—Bulletin D-84 presents case histories of time and investment economies resulting from use of automatic pipe nipple cutters. (Page 8)
A-12-153	Lehmann Co.	**Boring Machines**—Aid in solving boring problems is given in Catalog BT-12 by explaining how accuracy, utility and economy may be obtained. (Page 153)
A-12-173	National Broach & Machine Co.	**Gear Shavers**—Bulletin S 53-7 gives full details concerning an automatic, cam-operated differential up-feed device for gear-shaving operations. (Page 173)
A-12-116	Nelco Tools, Inc.	**Carbide Tools**—Complete listing and prices of Nelco line carbide-tipped tools are offered in a new catalog available from the manufacturer. (Page 116)
A-12-211	Oakite Products, Inc.	**Metal Cleaning**—"Some Good Things to Know about Metal Cleaning" gives information about Oakite cleaner for hard-to-remove industrial dirt. (Page 211)
A-12-138-2	O'Neil-Irwin Mfg. Co.	**Sheet Metal Notchers**—Complete details are given in 32-page catalog concerning notching, bending, brakes, punch presses, rod parters, rollers and shears. (Page 138)
A-12-136-1	Ortman-Miller Machine Co.	**Cylinders**—Free catalog and set of ½- and ¼-scale templets showing all cylinders and mounting brackets for air and hydraulic cylinders. (Page 136)
A-12-194	Rotor Tool Co.	**Air tools**—Catalog 40 gives case histories and describes how to reduce operator fatigue, cut maintenance, and sanding disk costs with air-operated hand tools. (Page 194)
A-12-140-2	Sorensen Center-Mike Corp.	**Center Mikes**—Free bulletin 652 describes the uses, construction features and how to use most effectively a micrometer for swiftly measuring hole center distances. (Page 140)
A-12-248	Sutton Tool Co.	**Collets and Chucks**—Twenty-six-page collet catalog and eight-page Levermatic Chuck catalog give design features and application suggestions for collets and checks. (Page 248)
A-12-155	Tomkins-Johnson Co.	**Air Cylinders**—Bulletin 8152 describes space-saving features, gives specifications, construction features and safety benefits of "Spacemaker" air cylinders. (Page 155)
A-12-254	Van Keuren Co.	**Light Wave Micrometer**—Free 220-page book presents a simple and exact method of measuring screws and worms with wires, gears, splines and involute serrations and aids in solving other measuring problems. (Page 254)
A-12-263	Waldes Kohinoor, Inc.	**Grooving Tools**—Technical manual presents 20 pages of application drawings, construction features and cost-cutting techniques derived from the "Truarc" grooving tool. (Page 263)

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Improved Gage Features

CITY ZONE NO. STATE

Broaching Fixture

A versatile air-powered broaching fixture designed to cut broaching equipment costs and speed delivery has been announced by National Broach & Machine Co., 5600 St. Jean, Detroit 13. The horizontal, self contained fixture will broach holes, keyways and contours on a wide variety of production parts.

The compact fixture consists of a cast iron base with two integral vertical flanges. A 5-inch diameter air-hydraulic cylinder having a 25-inch stroke is mounted on a flange at one end of the base. The other flange in the middlle of the base supports the work rest plate. Two hardened and ground steel guide bars supported by the two flanges guide an automatic broach puller mounted on the end of the air cylinder rod.

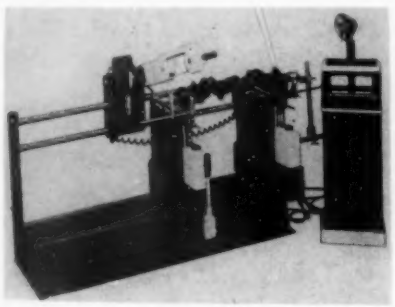
A four-way valve mounted at the

cylinder end of the fixture controls the air cylinder travel through the action of three manual controlled pilot valves located at the right of the fixture plate.

In operation, a part is placed on the work rest plate and the broach inserted through the part into the puller. Then No. 1 and No. 2 pilot valves are simultaneously depressed, causing the air cylinder to pull the broach through the part. After the part is removed from the rest plate, No. 1 and No. 3 pilot valves are depressed, causing the air cylinder to return the broach through the fixture and release it for removal before beginning the broaching cycle again. **T-12-1351**

Electronic Balancer

Quick setup in less than two minutes without a foreman, plus extreme range in capacity are the advantages which the company claims make the Stewart-Warner electronic industrial balancer excellent for maintenance as well as production balancing. High speed milling heads, cutters, and grinding wheels



may be precision balanced to avoid vibration marks.

Precision sensitivity is said to be possible at all weights of items checked or balanced from the range of ½ lb to 1,000 lbs. By turning a knob, five dash pot positions allow balancing at different sensitivities to a maximum of 0.04 oz inch. Because of balancing at mechanical resonance, sensitivity remains the same at all weights of object being balanced. The part being balanced is brought above the resonant speed and allowed to coast freely through the balancing zone, so that the readings are not affected by the drive belt or other contacts that may introduce possible error. The drive mechanism is operated by twisting a handle which is also used as a brake after the readings are observed. Setup to various lengths is done by a simple walking mechanism operated by a handle on a movable stanchion.

Length range is 4½ inches to 55 inches between bearing surfaces; diametral capacity is ½ inch to 44 inches. Because of quick setup, the balancer may be used on the production line and then for maintenance or experimental work when required.

Details may be had from the Merrill Engineering Laboratories, Dept. 31A, 1240 Lincoln, Denver, Colo.

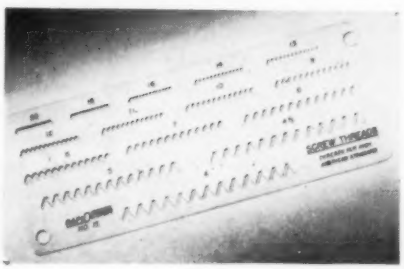
T-12-1352

Screw Threads Template

Rapidesign, Inc., P.O. Box 592, Glendale, Calif., announces its No. 15 screw threads template. Designed to draw the outlines of screw threads, this guide includes the entire range from 20 threads per inch to 4 threads per inch of the most commonly used American standard threads. Within that range, the template encompasses all standard screw diameters from ¼ to 4 inches.

It is made of 0.040 double-cured mathematical quality plastic, and cut-outs are precision smooth. Actual size of the guide is 6⅞ x 2¾ inches.

T-12-1353



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to its broader range of STANDARD reamers
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L&I Chucking Reamers in both Wire Gage and Letter Sizes are now STANDARD in long as well as short lengths. Other L&I exclusives include Dowel Pin Reamers, Right Hand Spiral Flute Reamers in Wire Gage Sizes. Complete line of sets, too. L&I King Size Reamers mean King Size Production.
L&I
The Reamer Specialists
LAVALLEE & IDE, INC.
CHICOPEE, MASS.
INDICATE A-12-135

in those hard-to-reach places...

fit where others won't!

O-M's SPECIAL INTERLOCKING MECHANISM, which does away with projecting tie rods and end caps, answers the old problem of how to get the necessary power when space is a factor. O-M Cylinders require ¼ *less installation space* than conventional cylinders with the same bore . . . and can be turned down to fit easily into the deep recesses of machine bases and equally hard-to-reach spots. They're ALL-STEEL with bearing bronze—no castings.

And O-M has the lowest coefficient of friction of *any* cylinder . . . smoother operating at low or high speeds regardless of length of stroke. End plugs tapped for universal mounting. Any one or combination of mounting brackets may be used to install *without disassembling or changing cylinder.* Easily removed, inspected, repaired.

Available in a full range of sizes (1½ to 8" bores) with standard, 2 to 1 or oversize rods. Completely interchangeable parts.

14 day delivery on most sizes

Write today for FREE catalog and complete set of ½- and ¼-scale templates showing all cylinders and mounting brackets.

MAIL COUPON NOW!

ORTMAN MILLER MACHINE CO.

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☐ Please send latest O-M catalog.

☐ Please send complete set of templates.

Name.....

Company.....

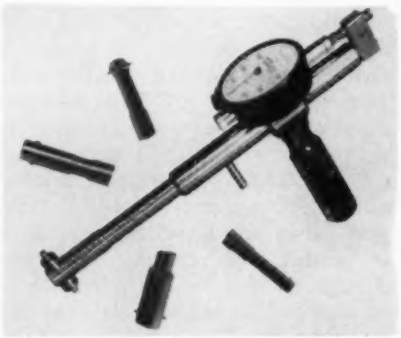
Address.....

City.....Zone...State....

INDICATE A-12-136-1

Improved Gage Features

Rimat Tool Co. has announced development of interchangeable gage heads as a feature of their dial bore gages. As a result, all standard gage heads for mesuring O ring grooves, snap ring grooves, pitch diameters of internal threads, small bores, and most special gage heads are now interchangeable on



one gage body. This development makes it feasible to use precision checking equipment on development projects short runs or contract work where formerly an expenditure for a complete gage was not justified. At the same time, it tends to bring precision internal gage costs within the budget of small shops.

Bulletin S-1, explaining this feature is now available from the company, 21 W. Dayton St., Pasadena 2, Calif.

T-12-1361

Terminal Blocks

Lok-A-Block, a device which enables users to build their own terminal blocks in various lengths and combinations up to 25 poles without waste, has been placed on the market by Ilsco Copper Tube and Products, Inc., Mariemont Ave., Cincinnati 27. This molded terminal block is sturdy, compact and with excellent electrical and physical properties. It requires a minimum of space and is flexible and adaptable.

It consists of three simple parts which can be assembled in a very short time without tools; Red Lok-A-Bloks which house the solderless connectors; the solderless connectors; and a yellow Lok-Strip which holds the assembly together and acts as an identification strip as well. The top is of a special mat finish which enables the user to mark the identifying numbers in pencil, ink or any other method.

The lugs or connectors used are produced from pure electrolytic copper and are rugged and practical.

Full details with illustrated construction and installation instructions may be obtained from the company.

T-12-1362

Balancing For Mass Production

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FAST!....
and ACCURATE!

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- GRINDING WHEELS
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- BRAKE DRUMS
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PRECISION DRILLING MACHINES

TAYLOR DYNAMOMETER AND MACHINE COMPANY

6411 River Parkway
Dept. E-12, Milwaukee 13, Wis.

INDICATE A-12-136-2

NEW! 24 Variable Transmission

Power Tube Flarer

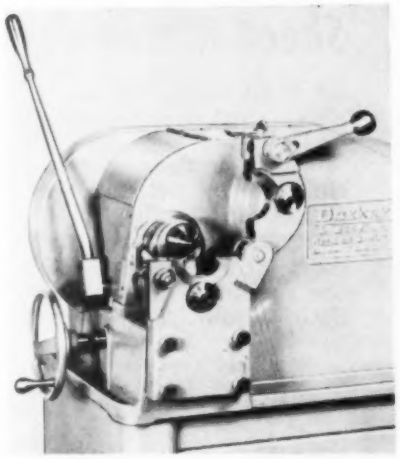
Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, designed and is now manufacturing a powered tube flarer, conceived to put tube flaring on a high-volume production level.

Designated Model 232A, the unit produces perfect, concentric, smooth-surfaced, 37-degree tube flares for use with standard Triple-lok and AN tube fittings. The flares meet the following standards: AN, JIC, SAE Hydraulic and ASME.

The machine, which will flare the full range of standard tube wall thicknesses and all tube sizes from ⅛ through 2-inch OD, handles annealed seamless copper, aluminum, steel and stainless steel tubing with ease.

In addition, the unit, by virtue of readily interchangeable heads and accessory attachments, may be used for squaring-burring of tubes.

Design of the tool incorporates simplicity and minimum maintenance requirement. Major working elements



include flaring center, spindle stops, vise and clamp die blocks, stop finger and variable-speed control.

The flaring center, which contains an eccentrically located flaring cone, fits into the spindle head. The spindle head has one index mark, while the flaring center is graduated with tubing sizes. Matching the tubing size graduation to the spindle mark gives the proper off-center location of the flaring cone with respect to tube center, insuring rapid, perfect flares. When set, the flaring center is screw-locked in the spindle head and is ready for production.

The forward travel of the spindle for flaring is regulated by simple adjusting screw dial nuts on a threaded rod. The rod is under a housing lid by the spindle lever and is readily accessible.

Tubing is clamped in position for flaring by a lever-operated, hinged, circular vise. A hook screw insures locking of vise with only slight hand pressure on the lever. Clamp block sets slide into the channels of the vise jaws and are made secure by circular lock keys. The clamp blocks act as the 37-degree die against which the driven cone forms the tube flare.

Adjoining the inside of the lower vise jaw is a stop finger which is used to limit the extent of the tube beyond the vise toward the cone. A simple adjustment screw regulates the finger's distance from the vise. The tube, when positioned in the vise for flaring, is placed flush against this finger, which retracts automatically as the vise is closed and is spring-returned to its original position as the vise is opened.

Setup of the power flarer for production simply requires insertion, indexing and locking the flaring center; insertion of vise clamp blocks; positioning stop finger; speed adjustment; and finally spindle travel setting with dial nuts. An operator after short experience with the machine is supposed to be able to set up in less than five minutes.

Once set up, the unit is ready for production flaring. For each flaring, the operator simply places the tubing against the stop finger, closes the vise, and thrusts the spindle hand lever forward.

Bulletin 1145A10 contains complete information on the machine. **T-12-1371**

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

THE JOB: finish grinding stainless steel bearing seal on outside diameter and chamfer bottom edge.
grinding time
cut
84%
with
Standard's Type A
Rotamatic Grinder
This Type "A" Dual-Head ROTAMATIC Grinder with completely automatic cycle and an inexperienced operator accomplished in 50 seconds the same operation which previously took 6 minutes with 2 expensive machine tools and 2 skilled operators!
Endless, Versatile Variations of Design, Arrangement, and Equipment best describe the multiple features of this new Standard line. Unusual versatility permits application to a wide variety of work. Send us your grinding problems and learn how Rotamatic will develop the solution, quickly at low cost.

- ASSN Spindle Nose
- Rotary Magnetic Chucks
- Complete Hydraulic Operation

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the STANDARD electrical tool co.
MACHINE TOOLS
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INDICATE A-12-138-1

Variable Transmission

Model 28 infinitely variable speed drive made by Graham Transmissions, Inc., Menomonee Falls, Wis. incorporates a number of improvements over previous models including 50 percent more power in approximately the same size, use of a two-piece housing with integral base, improved control that provides linearity which means equal changes in speed for equal changes in dial setting and cooler and more quiet operation. Improved power and performance are achieved primarily by sloping the tapered rollers downward from the input end, instead of upward as formerly, thereby providing greater effective roller dimension in the same space, simplified carrier construction and increased efficiency.

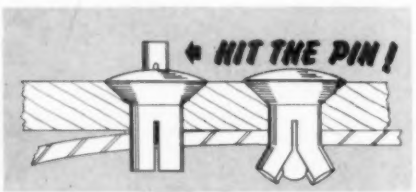
The unit is said to deliver all speeds from any desired maximum to zero and the speed may be changed with the transmission running or stationary. The drive incorporates built-in overload protection that protects both itself and the driven machine in the event of a jam or excessive overload.

The transmission is furnished as standard with a micrometer control permitting easy adjustment to or between the 400 graduations. **T-12-1381**

Countersunk Blind Rivets

Designed for installations where a finished head appearance is essential, the Southco oval-head countersunk drive rivet is offered as a blind fastening to wood or metal.

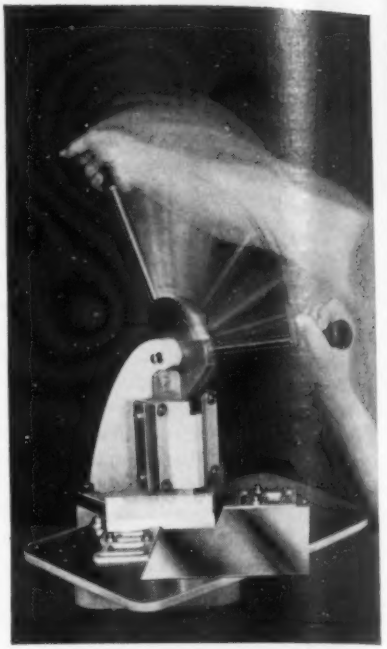
Oval-head rivets, initially produced for use in attaching molded plywood to the tubular framework of furniture, offer the three-fold advantage of being



capable of application from one side of the job, permitting unusual assembly speed, and attaching with a high degree of pull-up exerted in bringing parts together.

The drive rivets are installed with an ordinary hammer, requiring no special tools to drive the pin which expands four prongs to form a blind head against interior surface. They are available in diameters of 1/8, 3/16 and 1/4 inch, grip lengths varying from 3/32 to 5/8 inch.

More details are available from the manufacturer, Southco Div., South Chester Corp., Lester, Pa. **T-12-1382**

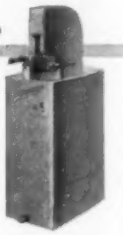


Notching Sheet Materials?

Do It Quickly, Easily with a DI-ACRO* NOTCHER

Speed up notching operations, eliminate the need for heavy presses and dies with a Di-Acro Notcher. A 6"x6" notch can be made in 16 gauge material in one operation. Many straight shearing jobs also performed.

*pronounced DIE-ACK-RO



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Di-Acro Power Notcher is especially designed for operations where high rate of production must be maintained. Motor driven flywheel and all moving parts housed in welded, steel cabinet.

Hand operated Di-Acro Notcher is ideal for short run production or experimental use.

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375 8th Ave.
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di-acro PRECISION METALWORKING MACHINES

INDICATE A-12-138-2

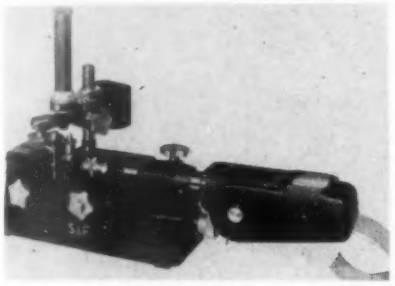
OUTSTANDING VALUES BY AMERICA'S LARGEST

Gear Tester

A two flank universal gear tester for the inspection of all types of fine pitch gears, including those of the smallest dimension, has been introduced in the United States by Kurt Orban Co., Inc., 205 East 42nd St., New York 17.

Outstanding feature of the S & F gear tester is its wide versatility. It may be used for the inspection of spur, bevel and helical gears; worms and worm gears; flat and round racks; pinion shafts; finished and semifinished gear assemblies; and extremely small gears and pinions used in instruments and dial gages.

The gear tester is said to operate on a principle recommended in the American Standard Inspection of Fine Pitch Gears. Both flanks of the test gear in the S & F tester are in contact with the master, so that the gears mesh without backlash. The basic instrument provides for visual indication, on a dial with a sensitivity of 0.0001, of all the errors affecting the actual performance of a gear under operating conditions. These errors are indicated as total composite error, which is made up of runout (including lateral runout or wobble) and tooth-to-tooth composite error.

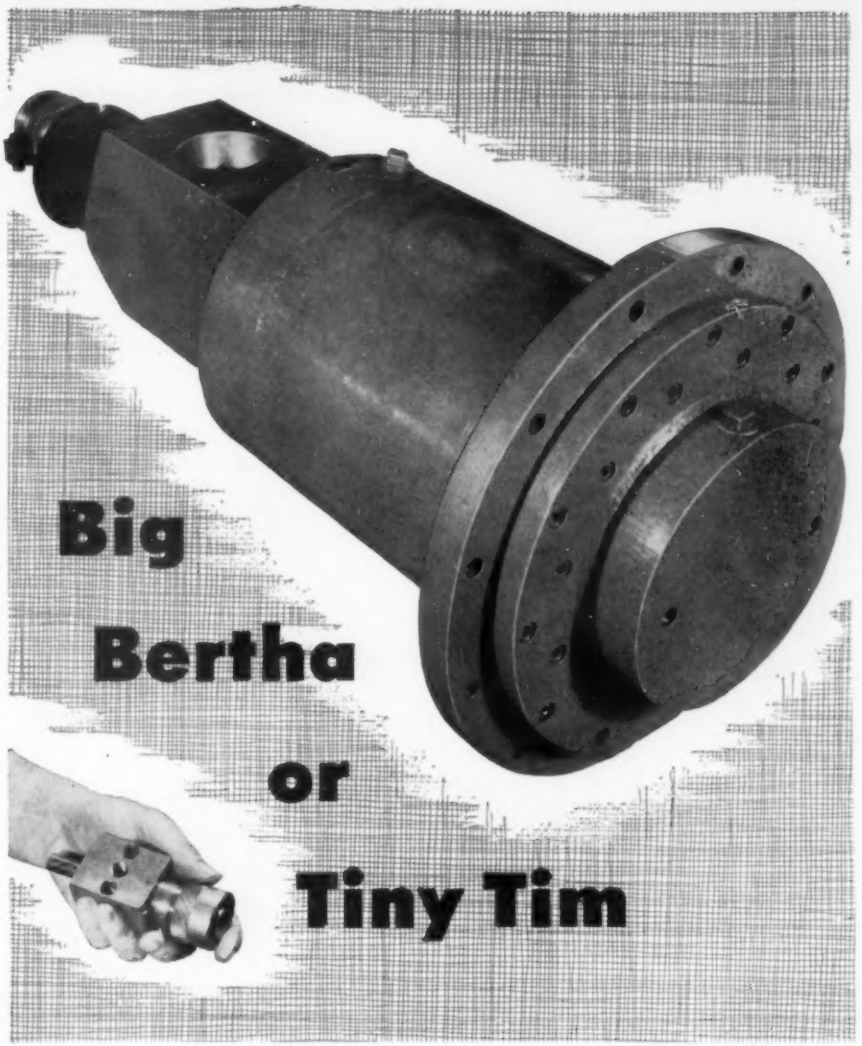


Addition of a Graphotest mechanical recording instrument provides a permanent graphic recording of errors.

Basically, the instrument consists of a bed slide, which carries the test gear, and a measuring slide carrier for the measuring slide and master gear. Bed slide and measuring slide carrier are mounted on a common base.

Interchangeable bed slides are available to adapt it to the inspection of various types of gears. For the inspection of assemblies of gears with shafts and bearings, the bed slide is removed, and the bed and measuring slide carrier used separately.

The unit can be supplied for either hand or motor-driven rotation of the gears. For high-production testing, a semiautomatic model can be furnished, for which only changing of the test gears is a manual operation. The entire test operation is then carried out on a predetermined cycle. **T-12-1391**



Your Anker-Holth cylinder matches your job

• Sure, the above cylinders are unusual. The big one has an 18-inch bore and 19-inch stroke, and handles 2000 p.s.i. hydraulic pressure! The little one has a 1-inch bore and is for air power. But both are all in a day's experience of the nearby Anker-Holth engineer who is available to help you solve problems in power motion. To be sure you get the *right* air or hydraulic cylinder for *your* specific job, *specify* Anker-Holth and ask for our engineering help. Call or write Anker-Holth Division of The Wellman Engineering Company, Dept. B-6, 2723 Conner St., Port Huron, Michigan.

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ENGINEERED CYLINDER POWER

WELLMAN

Division of THE WELLMAN ENGINEERING COMPANY

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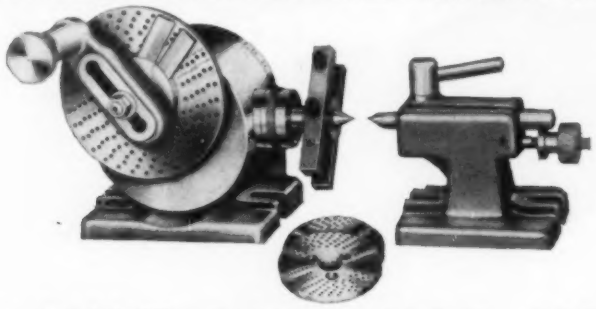
OUTSTANDING VALUES BY AMERICA'S LARGEST BUILDERS OF DIVIDING HEADS

You can't beat them for accuracy, ruggedness, quality.



L-W Model SD 6½" Swing DIVIDING HEAD

Spindle Threaded 1½"-8 to fit L-W 5" Universal Chuck

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Heavy duty headstock and tailstock designed for maximum rigidity. Alloy steel threaded headstock spindle with extra large tapered bearing and takeup adjustment collar. Head tilts to 90° in vertical position. Alloy stress-proof steel worm and accurately cut worm wheel cut to close limits for accuracy. Ball bearing thrust and adjustable for end play. Complete with three index plates for dividing all numbers to 50 and even numbers to 100, except 96T. Index chart shows all divisions obtainable to 360. Right or left hand models.

Model BP 11" Swing for plain milling machines. Shipping weight, 140 lbs. $225.00

Model AU 11" Swing. Fully Universal for complete indexing and spiral cutting. Shipping weight, 190 lbs. $327.50

Order from your industrial supply distributor or order direct, giving name of your distributor.

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MEASURES HOLE CENTER DISTANCES TO .0005" IN 30 SECONDS!

Center-Mike measures any center to center distance within range—regardless of hole sizes—in thirty seconds without set-up! Yes, this precision center mike COSTS YOU NOTHING! It pays for itself in a few weeks, and then goes on paying you a profit each time it's used! Save time—Save money—Your inspection department is not complete without the CENTER-MIKE.

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SORENSEN CENTER-MIKES, INC.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-140-2

Flat Lapping Machine

An easy and simple to use precision flat lapping machine is announced by Spitfire Tools Co., 2931-35 N. Pulaski Rd., Chicago 41, Ill., which speedily produces the finest microinch finishes. Important feature of this unit is that it offers the possibility of new time-saving production applications at a low cost.

Designed by lapping engineers for highly accurate lapping of metals, glass, quartz, plastic and other materials, this machine, called the Spitfire "24," is ideal for finishing all manner of pieces requiring exceptionally flat and smooth surfaces and which must be held to extreme tolerances of flatness and smoothness.

The unit, which has a convenient working-bench height of 38 inches, consists of a revolving lapping plate, 24 inches in diameter and 2 inches thick,

made of special, close-grained cast iron, properly heat-treated and constructed to prevent distortion. It is precision finished, supported by 6 precision ground ball bearings. The top has grooved Archimedean Spiral.

The simple, easy operating procedure means any average machine operator or factory worker can perform precision lapping operations without special training. There are no chucks, collets, holders or tools needed. Moreover, as many as four operators may work at the machine, thus providing additional means for reducing unit costs and speeding up assembly line precision lapping.

In use, the operator simply holds and manipulates the work on the revolving abrasive-covered lapping plate, exercising barely enough pressure to maintain the work in position. As a result, the heavy work of lapping is done by the machine, not the operator.

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Thickness Gage

Thickness dimensions of the first and third serrations on the root form of the dovetail section of jet blades may be checked simultaneously with a gage developed by The Sheffield Corp., Dayton 1, Ohio. The tool consists of two pairs of measuring wires that are connected to two yoke reed-mounted actuated mechanisms which, in turn, actuate two Plunjet gaging cartridges. These gage points are floated both horizontally and vertically to eliminate the location tolerance of the root form in reference to the matrix holding fixture.

Although this gage is said to have the accuracy of a fine precision instru-

ment, it is designed and built for rugged every day use at the production line and is simple to operate. While the blade is still incased in the holding matrix it is placed on the guide rails and pushed into gaging position so that the measuring wires contact the serrations of the root form which can be gaged along their entire length. The positions of the floats in the two-column Precisionaire instrument show whether or not the thicknesses of the root serrations are within tolerance.

The Precisionaire has an amplification of 2000 to 1 so that a thickness variation of only 0.001 of an inch moves the float two inches in the glass column. **T-12-1411**

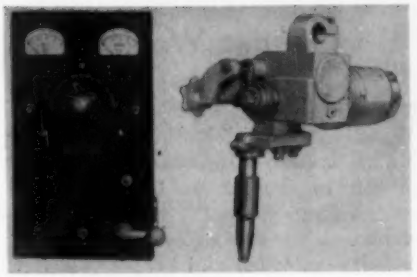
Automatic Welding Head

An improved Model 944 automatic welding head has been placed on the market by the Mir-O-Col Alloy Co., 312 North Ave. 21, Los Angeles 31.

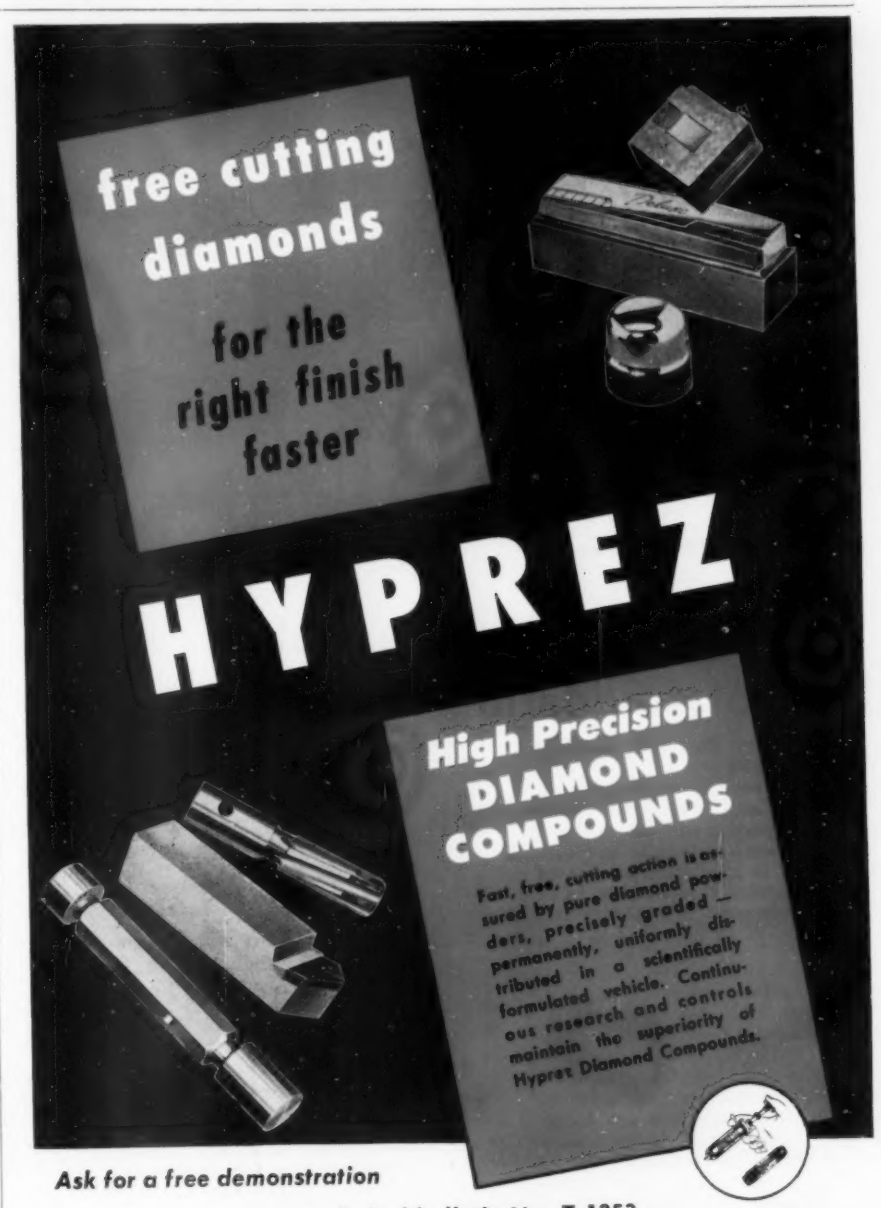
Control of both welding head and positioner operation is automatic, as well as the high frequency pilot circuit, if one is used. Both head and positioner are stopped automatically by the electro-mechanical control circuits if the arc is broken or electrode sticks to the workpiece. A control cuts off the high frequency unit when an arc is established. The motor is electrically independent of positioner and welder power supply.

The hardened steel feed rolls on the welding head are adjustable for both solid and tube wire and accommodate any rod size from ⅛ inch to ¼ inch in diameter. Hold-down roll has integral tension arm eliminating springs.

All parts of the Model 944 are readily accessible, and adjustments and repairs are handled quickly by the average mechanic with ordinary tools. The simplified control unit provides a manual "inching control." "welding voltage control" which regulates deposit rate; "travel control" for complete manual



control of positioner, and welding current control if transformer is equipped for remote control. **T-12-1412**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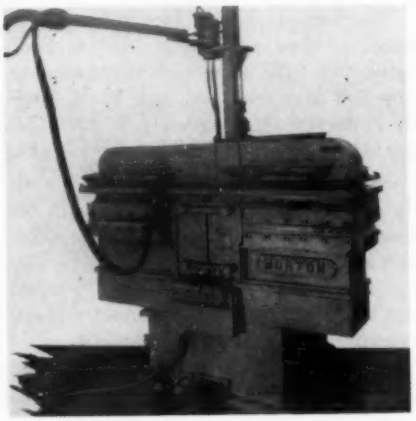
Contour Welder

The special high production capacitor can welding machine, made by Morton Mfg. Co., Muskegon Heights, Mich., utilizes a different design approach to contour welding. A twin-station setup is used to enable the one station to be welding while the other is being unloaded and loaded. Continuous constant velocity welding over the entire butt seam of the capacitor can is assured by independent speed regulation at the corners. Complete automatic control of the welding cycle is incorporated, with rapid traverse of the welding torch carriage when moving from one end to the other.



Other features of the machine include the use of special fluid and electrical rotary valves to allow continuous rotation of the welding torch and power ejection of the welded part. Throughout the design high unit clamping pressure is used to provide proper contact of the material to water-cooled copper back-up bars. **T-12-1421**

Carbide Finisher

A machine for the final finishing of carbide tools has been perfected by Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich.

Company engineers say that with this new method machine, which has been proven in actual production, it is possible to final-finish single point carbide tools without diamond wheels and without highly skilled operators.

This Hammond Model 454 carbide belt finisher is for final finishing with an abrasive belt after rough grinding with a silicon carbide wheel.

Construction of the unit features tungsten carbide faced platen, permitting the finishing of end, top and side clearance angles, and a conventional work table, which means there is nothing new for the operators to learn. As usual, there is one setting for all size tools, and belts can be changed without disturbing and setting.

This finishing machine can also be used for sharpening tools made from high-speed steel and for miscellaneous grinding and sharpening operations.

T-12-1422

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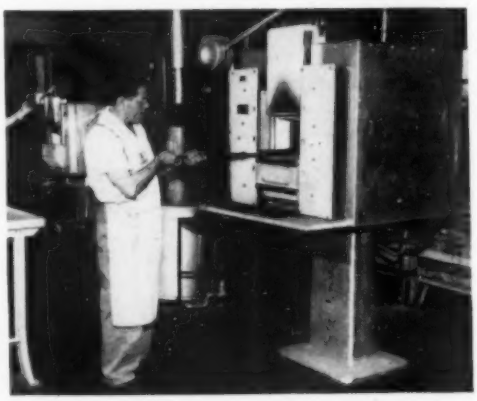
IBM

Sentry Keeps IBM Heat Treating Free of Oxidation—Decarburization

The Sentry Furnaces installed in the Poughkeepsie, New York, plant of International Business Machines Corp. are used to harden high speed and high carbon, high chrome steel tools and dies employed in the manufacture of IBM Electric Typewriters, Key Punches, Sorters and Proof Machines.

Tools which are Sentry heat treated include saws, milling cutters, lathe tools and form cutters, blanking and forming dies, and punches. IBM, through Sentry Furnaces, and Sentry Diamond Blocks, consistently produces these tools with optimum hardness, entirely free from oxidation or decarburization.



Sentry 2Y and 5Y Installation at International Business Machines Corp., Poughkeepsie, New York

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Valve Reduces High Pressure

An oil pressure reducing and regulating valve, for reducing high pressure to low pressure, has been introduced by the Eclipse Fuel Engineering Co., Rockford, Ill. for their series CF closed flame gas-oil burners.

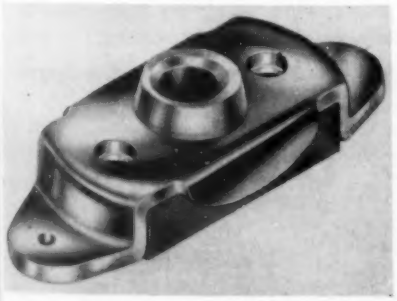
This valve is a single-seated, spring-loaded, direct-acting diaphragm type. It is said to automatically reduce high pressure to low pressure and maintain the low pressure regardless of fluctuations on the high pressure side. It is constructed so that any restriction forces the valve wide open with a self-cleaning effect of the seat. A built-in strainer safeguards working parts, and also aids in surrounding the parts with a uniform temperature fluid to prevent sticking or seizing.

A large bottom plug permits easy inspection and cleaning of parts. Worn parts are simple to replace through this same opening, which avoids necessity of installing a new valve. **T-12-1431**

Nut Plate Bushings

Nut plate Anchor bushings, for use on drill templates, provide a simple inexpensive means of locating and drilling three coordinated screw and rivet attachment holes for nut plates.

Among the principal advantages offered is the two-way cost reduction. First, only one Anchor bushing, rather than three conventional drill bushings, is required, which automatically simplifies the making of the drill tooling.

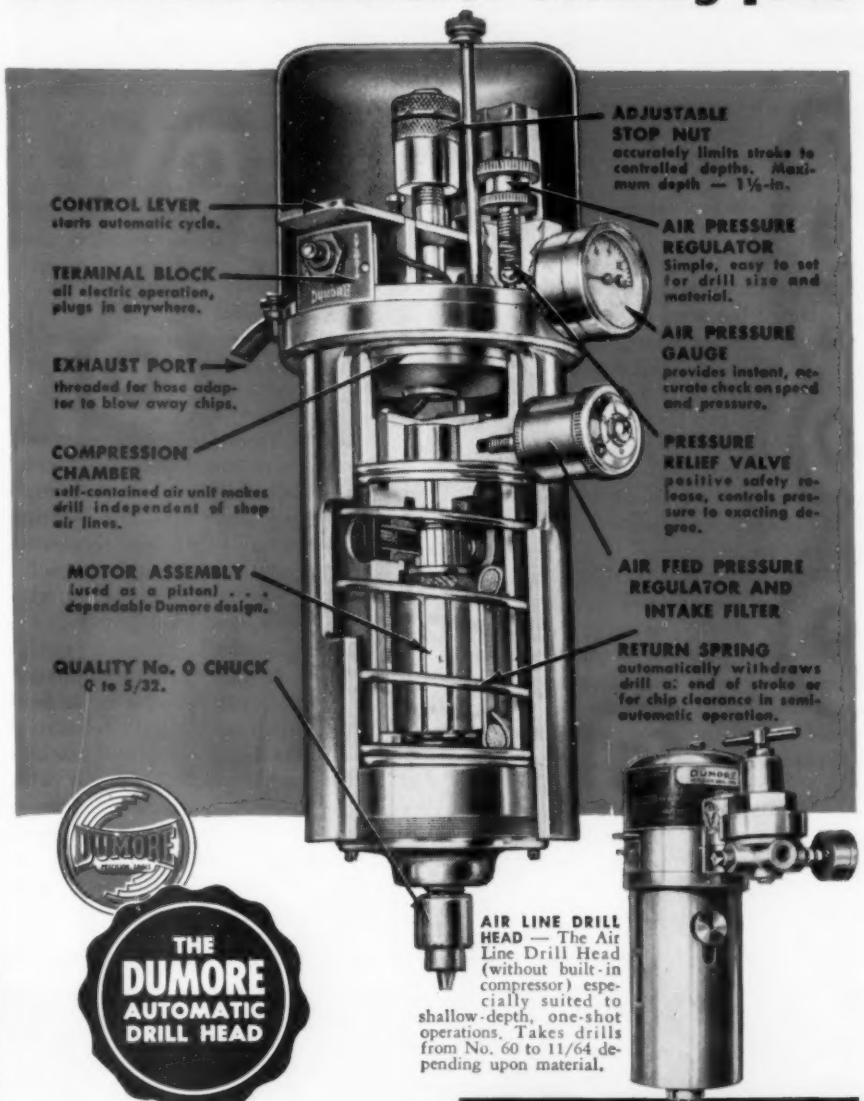


Secondly, all regular Anchor bushing advantages of material savings, flexibility to meet changes and ease of handling lightweight templates are realized.

Two styles are available; the end type nut plate Anchor bushing features a minimum edge distance location allowable, and the cross type is used where edge distance is not critical. Screw sizes accommodated are #6, 8, 10, 1/4, 5/16 and 3/8 inch.

Catalog giving complete details of Nut Plate and other types of Anchor bushings is available from The Hi-Shear Rivet Tool Co. **T-12-1432**

Fewer drills per 1000 pieces, MORE HOLES PER DAY on small diameter drilling jobs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positive safety release, controls pressure to exacting degree.
COMPRESSION CHAMBER
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AIR FEED PRESSURE REGULATOR AND INTAKE FILTER
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(used as a piston) . . . dependable Dumore design.
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QUALITY No. 0 CHUCK
0 to 5/32.
DUMORE
THE DUMORE AUTOMATIC DRILL HEAD

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WITH the Dumore, size of drill and hardness of material determine speed and pressure at drill point. Pressure is positively regulated by a sensitive relief valve. This assures uniform drill penetration, reduces breakage and prevents overloading. Drills cut smoothly, retain their edge longer.

The Dumore starts and withdraws automatically. Depth and center are accurately maintained to exacting limits on every stroke.

As a result, even with relatively untrained operators, you get more production per day and less drill breakage due to operator error — even on jobs requiring No. 80 drills.

In addition, the Dumore is self-contained, independent of shop air lines. It quickly adapts to any specific production arrangement. Minimizes special tooling and fixtures.

COMPACT IN SIZE — 14½" long. 4½" in dia., weighs 17½ pounds. Completely automatic, built-in controls. Meets a variety of installation applications.

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Technical Digests

AUTOMATIC MACHINE CONTROL

by Perry L. Nies

Ultrasonic Corp.
Cambridge, Mass.

IN THE INDUSTRIAL AGE machines have eliminated the need for heavy muscular work by human labor. Now mechanization begins to replace the sensory system of man as a control device.

Several manufacturers of computer and servo equipment have undertaken with their own funds or under contract with machine tool builders to design and fabricate control apparatus directly applicable in machining.

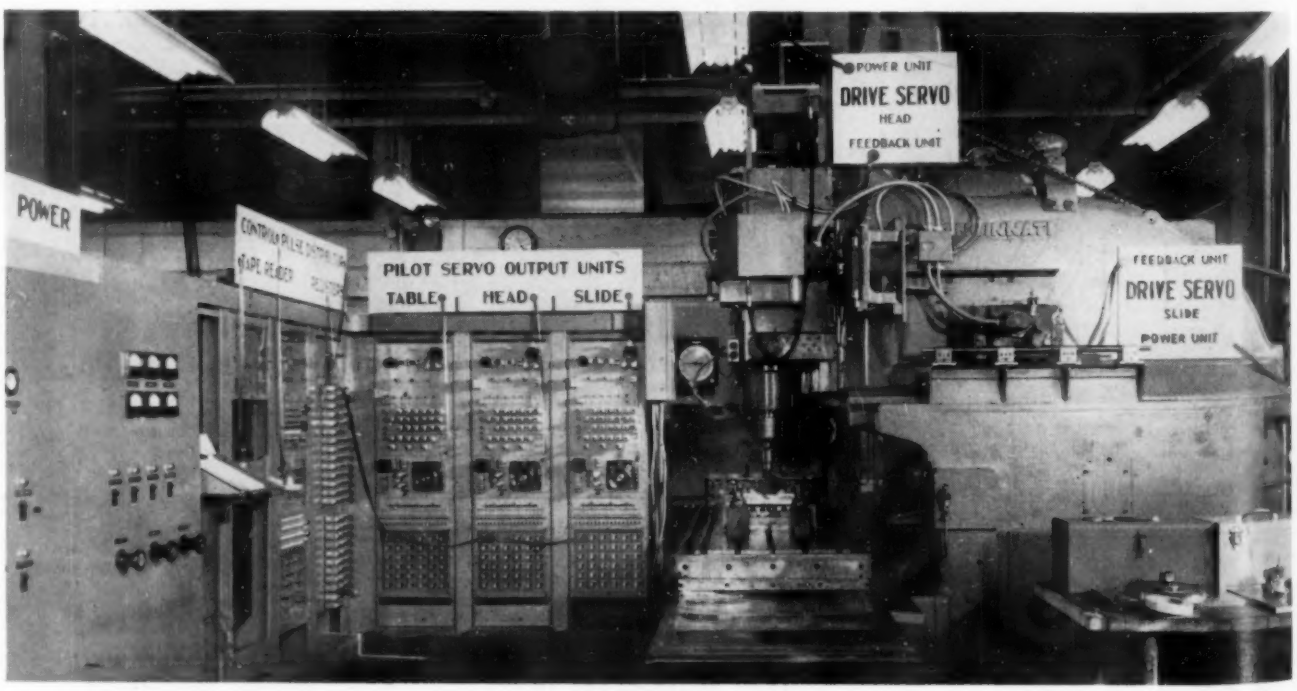
One example is a locating table used to position a workpiece beneath a drill spindle, *Fig.* 1. The table is directed to successive positions by punched paper tape coded with coordinate specifications for each position. The device would offer the user advantages as follows:

Elimination of positioning fixtures
Ease of change of specifications
Reduction of setup time
Reduction in spoilage
High accuracy of reproduction, piece to piece
High accuracy of relocation, for successive drilling, reaming, tapping, etc.

Principal obstacles to be overcome before the equipment is offered commercially are chip removal and high initial control cost. Still, the locating table directed by paper tape represents a tool and control combination, useful for a common machining operation, with potential widespread application.

Programming computer control equipment, armed with high performance service, has already found a fertile field in cutting irregular shapes customarily requiring many hours of careful machining by a highly skilled operator with extensive hand finishing. An example of this type of equipment is a paper tape controlled milling machine in operation at the University of Texas. Built in 1945, the unit has been under heavy continuous loading, milling master cams for test simulation in a military computer to an accuracy of 0.001 inch. Punched card data directs the milling of master turbine blades for experimental test at the N.A.C.A. Laboratory in Cleveland. The dollar savings possible in machining irregular shapes is dramatically illustrated by a radar template cut on the numerically controlled milling machine in operation at the M.I.T. Servomechanisms Laboratory. A five-foot template *Fig.* 2, costing $3500 by conventional methods, was produced for less than $500 under automatic program controlled milling. Similarly a master cam generating machine now under private development promises to cut engineering costs by 30 percent and cam production costs by 50 percent. The unit will operate directly from punched paper tape containing a small number of incremental radii, and angle

Fig. 1. Computer controls and high precision servo equipment positions workpiece for drilling.



specifications to shape and grind accurate master cams.

These devices have their principal value as proof for persons who must see samples of such unusual machining procedures before placing credence in them. Now, many critical observers

Fig. 2. Template machined automatically.

in the machine tool field are convinced that programmed computer controlled machines can make parts to satisfactory tolerance, finish, and speed. The question largely unanswered remains: will such equipment also be economic?

Many look to the aircraft industry for widespread adoption of computer controlled machines. Several factors point to growing application in aluminum fabrication, provided economics are clearly and carefully worked out. Complexity of shape, numerous setups and short runs provide an ideal climate for application of program computer controlled machines. Electronic technicians are on hand in most aircraft firms to take over the job of specialized maintenance.

For the past few months the M.I.T. Servomechanisms Laboratory has been accepting contracts for production-run milling to aircraft specifications and time schedules. The machine is used both to finish aluminum forgings and

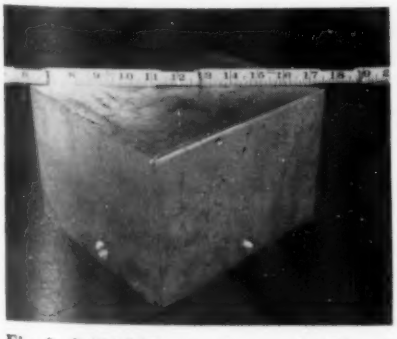


Fig. 3. Solid billet used to make Fig. 4.

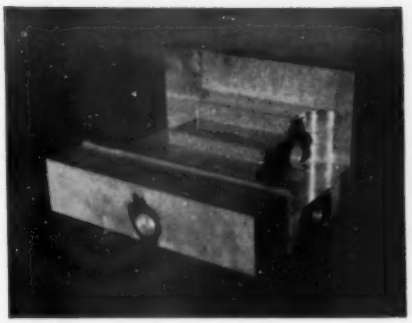


Fig. 4. Finished part.

to hog out finished parts from solid stock. A thirty-seven-pound aluminum billet eight inches on a side, *Fig.* 3, was reduced to a two-pound fitting, *Fig.* 4, in six hours' machining time, twelve hours' setup time. A $10,000 investment in forging dies was eliminated. It is the intention of the Laboratory to accumulate costs of the operation under numerical control to compare with costs of fabrication by forging dies.

This will provide application data and may lay the groundwork for aircraft industry-wide adoption of program controlled machines within the next few years. Program computer controlled machines may soon rank with conventional tracer machines and general purpose equipment as low-cost producers on the manufacturing floor.

From a paper presented at the 1953 *AIEE* Special Conference on Machine Tools.

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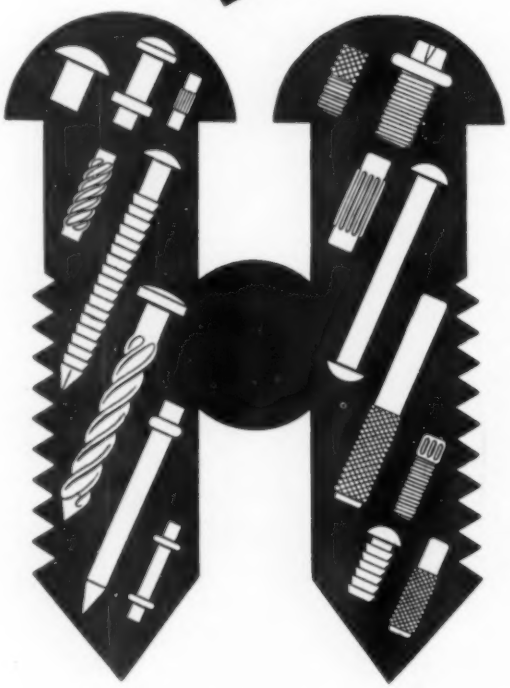

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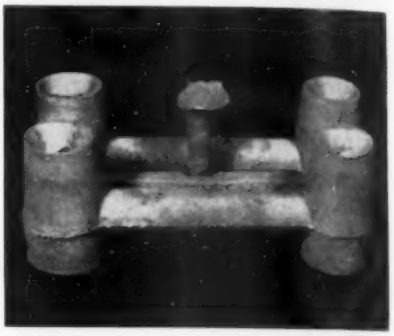
Dynamic Properties of Nodular Cast Iron

by Harry Majors, Jr.
Research Professor
Bureau of Eng. Rsch.
University of Alabama

Rotating beam endurance tests at room temperature have been conducted on 0.86-in.-diam minimum notch sections and 1.25-in.-diam minimum unnotched sections in order to compare



Casting of magnesium-iron from which fatigue specimens were machined.

fatigue data obtained from geometrically similar specimens having minimum diameters of 0.19 in. and 0.30 in., respectively. Comparisons have been made for tension-test data obtained from sections of 0.19 in., 0.50 in., and 0.75 in. diam. A series of exploratory tests in fatigue was made on grooved specimens and for two notch angles for comparison with results obtained on ungrooved specimens. Results are reported for the optimum chemical composition without any nickel content in the annealed and as-cast condition.

This investigation was concerned with the effect of size of test specimen upon the dynamic stress-concentration factor of magnesium-treated cast iron, having an optimum chemical composition (no nickel content) as indicated. The following comments result:

Size Effect from Thin Castings

It was noted for castings 0.75 in. thick in the annealed condition and unnotched test sections 0.30-in.-diam and larger that there is a trend for a small size effect, whereas for sections less than 0.30 in.-diam there is a noticeable size effect upon the endurance limit.

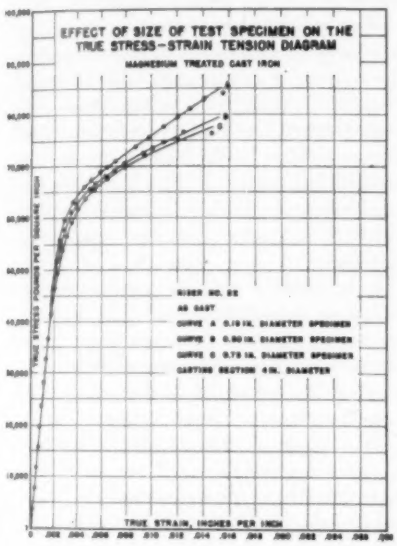
Size Effect from Large Castings

For unnotched specimens in the annealed or as-cast condition, there is no significant size effect on the endurance limit for test sections ranging from 1.25 in. to 0.30-in.-diam when specimens are removed from a 2.0-in.-diam castings.

Technical Digests . . .

A comparison of data from 4.0-in.-diam with those from 2.0-in.-diam castings did not reveal a significant size effect. No data were obtained for sections smaller than 0.30 in.

Notched fatigue specimens showed a "size effect" in both the annealed and as-cast condition. Notches in large fatigue specimens (D=1.50 in.) in diameter have an endurance limit of 18,000 psi while notches in small specimens (D=0.38) have an endurance


EFFECT OF SIZE OF TEST SPECIMEN ON THE TRUE STRESS-STRAIN TENSION DIAGRAM
MAGNESIUM TREATED CAST IRON
TRUE STRESS, POUNDS PER SQUARE INCH
TRUE STRAIN, INCHES PER INCH

limit of 21,000 psi. No data were obtained for notches in rods smaller than 0.38-in.-diam. Also, the dynamic stress-concentration factor is higher in large notched specimens than in smaller ones of similar geometry.

A size effect was discernible for tension specimens machined from 2.0-in.-diam castings. In the as-cast condition, the tensile strength and true strain at fracture were higher for a 0.19-in.-diam section than for a 0.75-in. test section. Proportional limit and modulus of elasticity were the same for both sizes.

For tension specimens in the annealed condition, the proportional limit and true strength at fracture were larger for 0.19 in. than 0.75 in. sections. True strain at fracture and modulus of elasticity were not affected by size of test section.

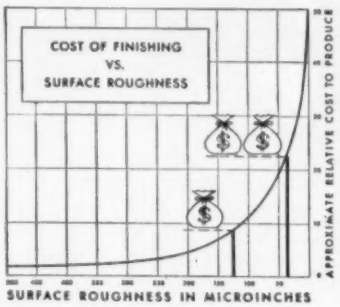
The endurance curves were identical for specimens removed from 4-in.- and 2-in.-diam castings. Also, no difference of any magnitude was observed in testing tension specimens at room temperature isothermally.

From a paper presented at 1953 Semi-Annual Meeting of ASME, Los Angeles, Calif.

▼ ▼ ▼

Surface finish control can reduce *your* machining costs

PROPER surface finish control may well yield big savings in your plant by reducing production costs, increasing production rates, and improving product performance.



The chart shows how finishing affects the cost of machined parts. For example, if the surface finish is specified as 125 microinches and you are overfinishing to 32 microinches because of lack of proper gaging equipment, your finishing cost can be twice as much as necessary. To eliminate costly overfinishing, actual checks of machined surfaces should be made in the shop to be sure that specified values are met *but not exceeded.*

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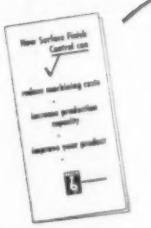

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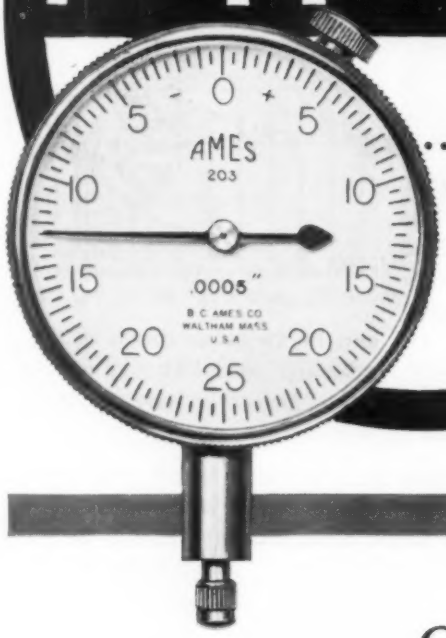

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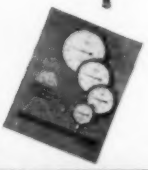

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Technical Digests . . .

Philosophy of Industrial Design

by Jean O. Reinecke, President Society of Industrial Designers

It is time that professional industrial designers publicly state their philosophy in a positive manner. This is necessary because of the innumerable times one hears a basically different philosophy expressed by men who assume spokesmanship for the design profession.

The occupation is that of designing products for mass consumption, and in the process it is essential that industrial designers familiarize themselves with production, distribution, and the desires of the public. In the course of years of experience responsibility to society has been recognized—a responsibility which neither requires nor permits compromise.

It is realized that the world of today exists on interdependence and that any philosophy based upon egocentric principles is immature, incomplete, and invalid. An assumption that the public is incompetent to pass judgment seems to be absurd. Naturally the average consumer is not so well versed in aesthetics as those who devote their entire lives to the study and application of the subject, yet the entire profession is based on the fact that what industrial designers consider to be better designed products sell in greater numbers. If this were not true, there would be no designers.

Being different certainly is no guarantee of superiority. Improvement can only result from change but change does not always entail improvement. Fresh design isn't always refreshing to the average person.

It is necessary to have what might be termed experimental design. From these experiments come the improvements in a process calling for ceaseless analysis and rejection, yet quite often designs appear which are heralded as good merely because of their revolutionary or different aspects. A competent designer is an experimenter who is also capable of analyzing, selecting and developing. Experimentation alone is not enough—it is but the seeds and not the fruit.

Responsibility to the public, clients and fellow designers is an obligation. The Code of Ethics adopted by the Society of Industrial Designers at its inception is the essence of the profession's philosophy.

From an address given at the 1953 annual meeting of the Society of Industrial Designers.

PRATT & WHITNEY

esses would be advantageous from the standpoint of manufacturing, design

Abstracts of Foreign Literature

By M. Kronenberg

Development of Swiss Machine Tools

Progress of the machine tool industry in Switzerland is discussed by F. Pohl in an article published in the Swiss magazine *Technica* of August 1953. Taking the years 1947 to 1950 as a base, Swiss machine tool exports have doubled up to 1952. That year a total of about $50,000,000 worth of machine tools were exported and about $17,000,000 worth of machine tools imported.

There are about 100 machine tool manufacturers in Switzerland (as against 300 to 400 in USA) for all types of machine tools. Among the heavier machines described is a lathe which removes chips of about 1¾-inch depth of cut and 0.080-inch per revolution feed, requiring a cutting force of 27,500 lb when machining a rotor shaft of 32 inches diam and a weight of more than 23 tons. The tolerances at the bearings of this shaft were kept within ±0.0018 inch. Other machine tools of high precision are made for watch manufacturing and similar industries.

Some copying devices built in Switzerland are similar to American designs, employing a duplex arrangement of tracer units, one in the front and the other in the rear of the lathe. The front tracer unit is for roughing, the rear unit for finishing operations. It is also possible to use them for inside and outside diameters simultaneously. The accuracy of a spindle automatic with nine speeds ranging from 1000 to 7000 rpm and 27 crankshaft speeds has recently been improved from about ±0.0008 inch to as little as 0.00008 inch.

Handling time on this machine is reduced by a hydraulically operated return stroke, a device for rapid chucking and an electro magnetic traverse. On another design, the headstock is centrally located between two horizontally arranged V-guides to reduce vibration. The paper describes many other Swiss machine tools and contains more than 130 illustrations, numerous data on calculations, time-study charts, operation plans and related information.

Congress on Welding and Foundry Techniques

A meeting was held in December 1952 by the Swiss Association of Tool Engineers to discuss and clarify conditions when casting and welding proc-

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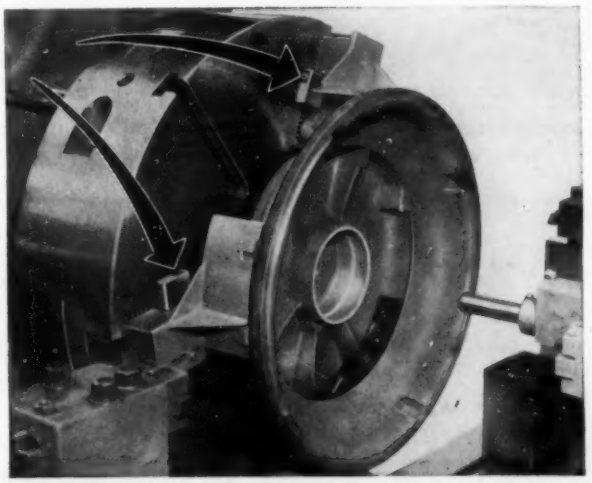
for precision adjustment of lathe chucks

Designed for easy installation on any top jaw used on an American Standard Serrated Jaw Chuck. Top jaws are then interchangeable on any chuck of American Standard Serrated type. Precision adjustment is made by using the hex wrench furnished with the Jaw-Set. Only one screw is required to control microadjustment.

The rigidity of a non-adjustable chuck plus complete precision adjustment of each jaw!

The Potter and Johnson Co., of Pawtucket, R. I. was the first machine tool builder to recognize the advantages of the Whiton Micro Jaw-Set used in combination with Whiton Air Chucks. This 24" Whiton Air Chuck is mounted on a 6D Potter & Johnson Automatic Turret Lathe tooled for quantity production of motor end shields. The operator can make microadjustment of any jaw with the Jaw-Set. Jaws can be set precisely concentric for second operation work.



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because doubling intensity of light, for example is noticed only as a 30-percent

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MACHINE TOOLS • CUTTING TOOLS • GAGES

esses would be advantageous from the standpoint of manufacturing design and cost. The numerous papers presented have recently been published in 1953 issues Nos. 7 and 8 of *Industrielle Organization.*

Physical and metallurgical aspects of various types of weldments were discussed by C. G. Keel. Swiss standards, materials, temperatures, shrinkage and deformation of welded workpieces, means for stress relief and other such details were covered. B. Lauterburg contributed a paper on principles of welding design such as elasticity, plasticity and stresses. Charles Tschappat in the same magazine discussed utilization and application of electrodes in welding operations; A. Schlatter presented recent designs of welding machines. Other topics centered about resistance welding and arc welding.

Castings were treated in several papers. Likewise papers on cast steel, malleable iron, precision castings and powdered metals were presented. George Anders in another paper gave examples of "right" and "wrong" design of castings with cases which often give trouble to the production engineer on machining.

A part of this meeting is typical of the significance attached increasingly by industry to the relative merits of welding and casting in supplementing each other. E. Bickel discussed the technical and economical principles governing the selection of either manufacturing method for present day machine tools. He covered problems of rigidity, wear resistance, comparative cost of fabricated and cast machine elements, concluding that the important factors to determine the economical method for a given case are lot size, overhead and proper design.

Standard Numbers

Relatively little is known in the USA of a system of standard numbers popular in European industries for many years for dimensioning tools, rpm's of machines and other instances involving numerical series. As a basic standard for spindle speeds of machine tools and feed rates, a multiple of the tenth root of ten is used (1.26); that is, spindle speeds increase on many machine tools by 26 percent when changing over to the next higher speed. The advantage associated with such a standard number system for time study and other items of importance to the tool engineers are numerous. Some of the simple mathematics involved are discussed in an article in 1953 issue No. 4 of *Werkstattstechnik und Maschinenbau* by Tuffentsammer and Schuhmacher. They indicate that this numbering system, based on logarithms, is natural

Technical Shorts . . .

gram is carried out largely through the assignment of instrumentation research

because doubling intensity of light, for example, is noticed only as a 30-percent increase by the human body while the logarithm of 2.0 doubling is 0.3.

The authors include practical examples such as the possibility of multiplication of several figures without a pencil. Applying this principle to time studies and similar items requires only memorizing the logarithms of the ten numbers between 0.1 and 1.0. Preparation of diagrams is also discussed.

European Transfer Machines

The latest developments in transfer machines in European automotive industries is discussed by H. Goebel in No. 3, 1953 of *Werkstatt und Betrieb*. Automation, timing, determination of production lots, localization, number of stations, fixtures and sequence of operations are covered with operation sheets and illustrations of German machines.

Spectroscopic Checking of Materials

A rapid method for checking the properties of steel bars used in the automotive industry is described by W. Rudolph in No. 3, 1953 of *Werkstatt und Betrieb*. An electric arc is produced at the end of each bar to be tested and observed through a spectroscope to determine the chemical composition. Particularly useful is this method for checking chromium content or manganese content and other alloys in steels both from the standpoint of proper function and of machining. A great number of examples is given showing frequency of rejects, and other details of the methods, which can also be used on shafts, axles and other parts.

European Machine Tool Show

A machine tool exhibition was held in September 1953 at Brussels, Belgium, as a third in a series of European machine tool shows since the end of the war. In a special show issue for September 1953, Werkstatt und Betrieb, W. Vogel reports on the German machine tool industry, E. Henrion on the Belgian machine tool industry, while M. Chalvet reports on machine tools produced in France. The Swiss machines are discussed by F. Pohl, Italian machines by R. Denon, British designs are commented on by P. Grodzinski and Austrian by J. Zenen.

Among other things, the Italian reporter indicates that American experts have been brought over to Italy and have improved production facilities. This cooperation with the USA experts has placed more importance on advertising on the part of Italian manufacturers of machine tools to compete on the world market.

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PLUS A CRITICAL PITCH DIAMETER CHECK

This is accomplished by using two-ribbed rolls truncated to 3/8 pitch crest flat and cleared root. Gaging operations are fast, simple and dependably accurate.

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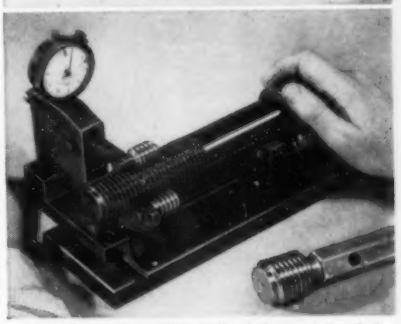

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NBS Office of Basic Instrumentation in has been possible to take advantage of prentice Training and Graduate En-

Technical Shorts . . .

NEW APPLICATIONS of physical principles are being evaluated and applied to problems in measurement and control during the program of research and development in basic instrumentation now in its fourth year at the National Bureau of Standards. Theoretical analyses are also conducted in various phases of instrumentation, and critical surveys are made of available instruments and techniques for types of measurement that are becoming increasingly important.

The technical work of the Office of Basic Instrumentation has two principal objectives: systematic analysis of available methods and devices in terms of their performance and characteristics, and research on new applications of principles and materials leading to the development of instruments and techniques not now available. This program is carried out largely through the assignment of instrumentation research projects to those NBS laboratories that are best qualified to conduct research in the particular field of science involved. However, the Office of Basic Instrumentation also maintains a small laboratory staff of its own for investigation of special problems and a group of specialists in instrumentation literature who are developing a reference and consultation service to aid in the solution of instrumentation problems.

The various projects included in the technical program may be classified into four groups:

1. Critical surveys of available instruments or techniques for certain types of measurement.
2. Projects for the theoretical or experimental evaluation of new applications of physical principles to general problems in measurement and control. Normally such projects are limited to a basic exploration of probable fruitful applications and do not involve development of specific instruments incorporating such applications.
3. Projects for the new application of physical principles to specific problems in measurement and control.
4. Projects for theoretical analysis and development in various fields of measurement, control, or handling of measurement data.

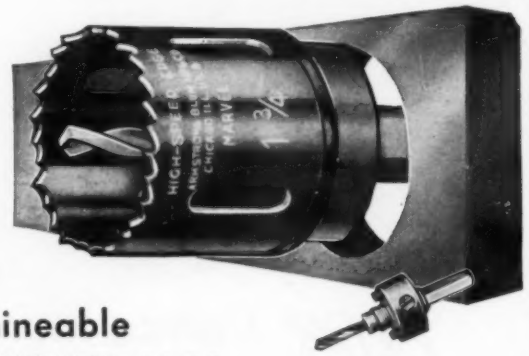
In the earlier phases of the program, experimental projects of the types described under 2 and 3 predominated, largely because technical personnel particularly suited for a number of such projects were available. However, as the program proceeded, it has been possible to place additional emphasis on projects under 1 and 4. In particular, survey projects have been initiated in a number of important areas.

The critical surveys of various general types of instruments are designed to assist the engineer or scientist in making the proper selection of existing types of instruments for new applications as they arise or to aid him in combining various elements of known characteristics in the design of new instruments. Such surveys also provide the information needed for adequate planning of more specific instrumentation projects. Surveys of this kind now in progress include studies of millimicrosecond oscillography, dynamic pressure instrumentation, strain-gage recorders, voltage-sensitive devices, and analog-to-digital converters.

Laboratory studies of more specific problems in instrumentation have resulted in a number of developments having broad potentialities for measurement or control.

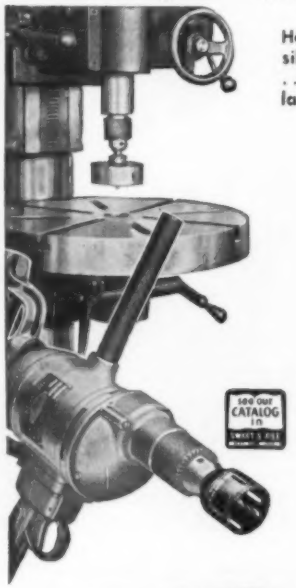
In connection with a program aimed at extending the range and accuracy of dynamic mechanical measurements, the

Cut...



LARGE HOLES

. . . thru any machineable material up to 1⅛ INCHES thick!



Here is a premium tool which makes it possible to saw holes in one short operation . . . large holes which heretofore had to be laboriously machined "a-chip-at-a-time."

MARVEL High-Speed-Edge Hole Saws have strength to withstand the terrific peripheral strains of heavy duty operation in lathes, drill presses or portable power tools. They have a high speed steel cutting edge which is electrically welded to a tough, alloy steel body, high speed steel pilot drills, heavy hexagonal shanked arbors and sufficient set for deep drilling. They are self-aligning, as the larger diameter saws float on their arbors and are driven by double drive pins. They will saw round holes accurately in any machineable material.

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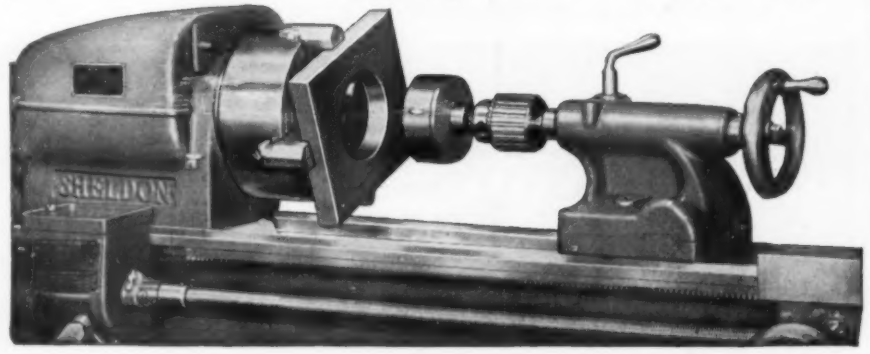

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A Clean Shop means

booklet points out that training for graduate engineers constitutes primarily acceleration of apprentice training

NBS Office of Basic Instrumentation in 1951 developed a miniature piezoelectric accelerometer for direct measurement of high-frequency vibrations. The device, which employed a barium titanate crystal as the compressive element, was extremely small but in many ways superior to other instruments used to measure mechanical vibration and shock. Further investigations of the barium titanate accelerometer, largely concerned with design characteristics and calibration methods, have continued. In the course of this work a model has been developed having exceptionally wide ranges of acceleration and frequency response (50,000 *g*, 100,000 cps).

Research and development work on applications of pneumatic principles have resulted in a series of new instruments based on gas flow at sonic velocity through nozzles. Utilization of these principles promises to provide improved instruments for the measurement of pressure, temperature, rate of flow, humidity, gas composition, mechanical displacement, and other quantities. A humidity measurement instrument has now been completed, providing a background of information that should be of value in the development of other instruments using sonic flow principle.

Other investigations of this kind that have been undertaken deal with such topics as the thermal noise thermometer, an electronic coating thickness gage, a carbon dioxide hypsometer, strain and displacement instruments, an ultrasonic velocimeter, feedback around image scanning systems, a phase sampling telemeter, the mutual inductance transducer, measurement of humidity by spectroscopic methods and microwave techniques, neutron spectrometer evaluation, and nucleonic instrumentation utilizing memory devices.

Improved instruments for measuring basic physical magnitudes are vital to advances in the physical sciences and their applications. Yet until recently the problem of designing instruments to measure different quantities and for use under different conditions has been largely left to the individual scientist or engineer working in his particular technical field. However, it is coming to be more and more widely recognized that the problems met with in designing various kinds of scientific instruments have much in common and that the designer of an instrument for a specific purpose can often benefit from the experience gained by others with instruments built for quite unrelated purposes. In an effort to realize the advantages that would accrue from coordinated planning of research on instrumentation as a science in itself, the NBS Office of Basic Instrumentation was established. Under such a program, it has been possible to take advantage of ideas and developments originating in various technical fields that have a bearing on basic instrumentation problems.

* * *

EXTENSIVE STUDY of training methods in the metalworking industry has resulted in publication of the booklet "Key to Survival and Growth" by National Machine Tool Builders' Association. Discussions approach three phases of programs: Learner Training, Apprentice Training and Graduate Engineering, all of which are in effect in many machine tool companies. In reviewing details, the booklet lays down specific instructions whereby any company, large or small, might start an effective training program.

A major emphasis is upon specific methods of inaugurating a Learner Training program.

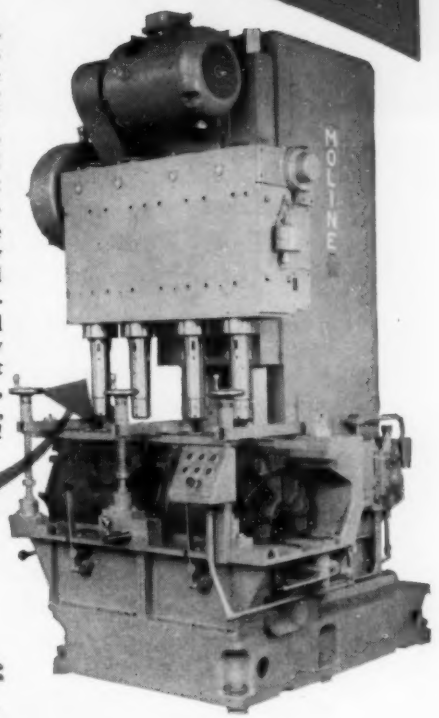
An earlier book published by the organization, "Apprentice Training Standards" outlines details and procedures for this training, and the current

Another Big Manufacturer came to LEHMANN for Precision Boring Tools!

The MOLINE TOOL COMPANY in Illinois was given an order for a four spindle hydraulic rail feed cylinder boring machine. They came to LEHMANN for the necessary boring tools. The arrow points to the boring bars and cutters which LEHMANN Boring Tool built for MOLINE.

More efficiency and accuracy can be put into YOUR boring operations by the engineering staff and skilled machinists at LEHMANN.

Boring Tools especially designed and engineered for your needs by LEHMANN can help cut machining time to a minimum, give you precision accuracy, save you money!



Depend on LEHMANN:

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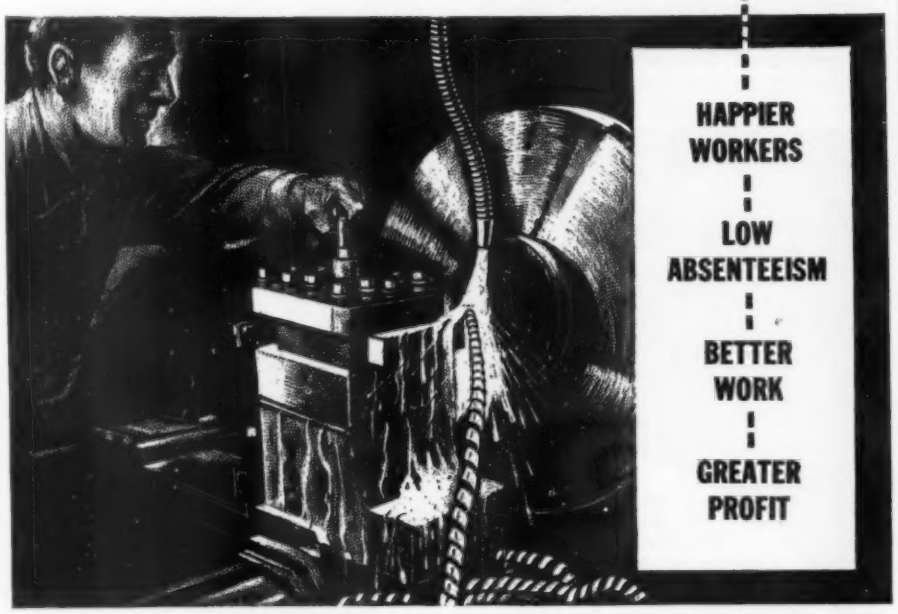
Who's Meeting

A Clean Shop means this to you



A clean shop is a pleasant place to work. Morale is high because there's no smoke, foul odors, dirty machines or greasy floors. Workers can feel more like craftsmen and produce better work at a lower cost to you.

Lusol gives you a clean shop

Start with a clean machine. Use Winsor Machine Cleaner to purge sludge, bacteria and grime from machines and coolant system. Then keep machines and system clean and clean smelling by installing Lusol, the all-chemical coolant that cleans as it cools. Lusol contains no petroleum oil to burn or smoke. It won't irritate skin like oil coolants—workers even wash their hands safely in Lusol.

In shops where it has been installed, Lusol is credited with production increases ranging from 50% to 500%.

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Write for *Lusol Gets to the Point*, a booklet describing Lusol, what it does and how it works in all types of machines in hundreds of machine shops. F. E. Anderson Oil Company, Inc., Box 213S, Portland, Connecticut.

Lusol.. ALL-CHEMICAL METAL WORKING SOLUTION

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booklet points out that training for graduate engineers constitutes primarily acceleration of apprentice training methods.

According to the booklet, aim of the report is to outline what seems to be basic principles common to generally such programs which have been consistently successful for some time, and to offer them to companies which may wish to adapt them to their own circumstances. It also emphasizes the necessity of top management planning as a factor in any program to give it thoughtful organization and also permanence.

A comprehensive bibliography and summary of movies, covering training subjects constitutes an Appendix to the booklet.

Copies may be obtained by request directed to the NMTBA's office, 10525 Carnegie Ave., Cleveland, Ohio.

* * *

SURPRISING RESULTS have been obtained by Loring Coes, Jr., assistant director of research and development at Norton Co., who has developed a form of mineral believed not to be found in nature. The piece was obtained by simulating conditions of pressure and temperature by which nature forms the rocks of the earth's crust. The results thus produced were a crystalized silica, much harder and a fourth more dense than ordinary quartz—its hardness is said to be comparable to that of garnet or topaz, with a Knoop hardness value of about 1300 measured with a 100 gram load.

By subjecting various substances containing silicon and oxygen to a pressure of 35,000 atmospheres at a temperature of 750 deg C for 15 hours—approximating conditions duplicated in nature at about 60 miles beneath the earth's surface.

The new material resembles mica, a common constituent of quartz-containing rocks, it is much harder and reacts differently than mica to chemical tests.

So far the commercial possibilities of the substance, which is considered a new dense silica, are unexplored. Production costs would probably be very high, but it may find use as a specialized abrasive or in piezoelectric crystals, and continuing research may yet develop other applications.

However, at the moment the prime importance of the discovery is that such a process is possible and possibly will shed considerable light on the question of how nature forms various minerals. Scientists and engineers now may be able to determine some of the mineral resources that lie beyond the reach of present man by duplicating conditions they believe exist at depths in the earth greater than he can penetrate.

Who's Meeting and Where

Jan. 11-15. SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, Sheraton Cadillac Hotel and Hotel Statler, Detroit, Mich. Write the society headquarters, 29 W. 39th St., New York 18, N. Y., for full information.

Jan. 22. MALLEABLE FOUNDERS' SOCIETY. General meeting. Hotel Cleveland, in Cleveland. The society office, 1800 Union Commerce Bldg., Cleveland 14, Ohio can provide details.

Jan. 25-28. PLANT MAINTENANCE & ENGINEERING SHOW. International Amphitheatre. Chicago. For full information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Jan. 30. AMERICAN SOCIETY FOR QUALITY CONTROL. Cincinnati Regional conference. Cincinnati Bldg., Cincinnati, Ohio. For details, contact society office, 70 E. 45th St., New York 17, N. Y.

Feb. 3-5. SOCIETY OF THE PLASTICS INDUSTRY, INC. Ninth annual conference, reinforced plastics division. Edgewater Beach Hotel, Chicago. Complete details may be had from the society, 67 W. 44th St., New York 36, N. Y.

Feb. 5-6. AMERICAN SOCIETY FOR QUALITY CONTROL. Middle-Atlantic regional conference, Lord Baltimore, Baltimore, Md. Write to the society, 70 E. 45th St., New York 17, N. Y. for more information.

Next Galliard Seminar on industrial standardization will be held by Dr. John Gaillard January 25 through 29 in the Engineering Societies Bldg., 29 W. 39th St., New York, N.Y.

Further details concerning registration may be obtained from Dr. Gaillard, 400 W. 118 St., New York 27, N. Y., or through the office of the American Standards Assn., 70 E. 45th St., New York 18, N. Y.

C. M. Cook, of the Cook Heat Treating Co. of Texas was elected president of the Metal Treating Institute at the annual meeting held recently. C. R. Weir, Commonwealth Industries, Inc., was named vice-president; and L. G. Field, Greenman Steel Treating Co., became treasurer.

The Packing Machinery Manufacturers Institute, at its 21st annual meeting, elected Robert T. Foreman of the R. A. Jones & Co., Inc., president for the coming year. At the same time, two members elected to vice-presidencies were Helen Horix Fairbanks, president of Horix Manufacturing Co., and Tom Miller, vice-president of Package Machinery Co.

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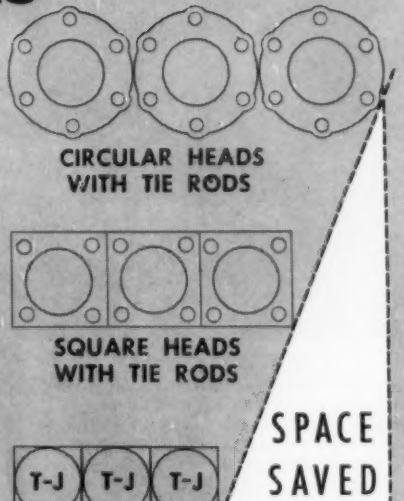
extra high safety factor!

NEW T-J Spacemaker AIR CYLINDERS

These new T-J Cylinders *save up to 40% in mounting space*—with streamlined design that eliminates tie rods. They're *super rugged*—extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, hard chrome plated piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 8152 The Tomkins-Johnson Co., Jackson, Mich.



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4 Weeks Delivery on the Spacemaker—any style, any stroke, 1" to 3" diam.

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TRADE LITERATURE

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Cutting Tools

Ninety-two page Catalog 54 describes and illustrates line of standard carbide cutting tools, as well as various types of special tools which Super produces. Includes up-to-date specifications, prices and data on each tool. Obtain copies by addressing the **Super Tool Co.,** 21650 Hoover Rd., Detroit 13, Mich.

How SUNDSTRAND Hydraulic Division Uses CLEVELAND Electronic Gages To Maintain Accuracy in Production

HYDRAULIC motors, transmissions and pumps are among the products of Sundstrand Machine Tool Co.'s Hydraulic Division, Rockford, Ill. Components are held to tolerances as close as 0.000050"

To make sure of the required precision, Sundstrand uses Cleveland electronic gaging equipment as shown below for checking gage blocks, master gages, production gages and tool setups. J. B. Gehlhausen, Foreman of Tool and Gage Inspection, reports that Cleveland gages are consistently accurate, easy to read, and can be set up or changed over in a minute or two.

Checking gage blocks to 0.000001" for size and parallelism at Sundstrand's Hydraulic Division, using Cleveland MICRO-AC Electronic Microcomparator. Every gage block in the plant is checked annually this way; and all replacement gage blocks are given the same inspection. The standard MICRO-AC reads 0.000010" or 0.000001" per scale division, as selected by a knob on the amplifier panel.

Sundstrand's master and production plug gages are regularly checked with a PAR-AC electronic gage as shown; and all new plug gages are inspected upon receipt. High-speed meter shows deviations from nominal size in increments of 0.0001" or 0.000010" per scale division.

Checking distance between two boring tool bits with INDI-AC Electronic Indicator in Sundstrand's Tool and Gage Inspection Department. This company uses the INDI-AC for all types of surface plate work.

More and more users find, like Sundstrand, that Cleveland electronic gaging equipment offers an unusually useful combination of operating features. Want details? Write for illustrated bulletins.

Designed, developed and manufactured by

CLEVELAND INSTRUMENT CO.

Formerly Graham-Mintel Instrument Co.

741 CARNEGIE AVE. CLEVELAND 15, OHIO

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-156

Gears, Speed Reducers

Pocket-size catalog describes entire line of stock gears, speed reducers, sprockets and chains, couplings and special gears. In addition to being a specification and price book, it also contains extensive hand-book information such as useful tables and engineering data relating to power transmission. **Grant Gear Works, Inc.,** 154 W. Second St., Boston 27, Mass. **L-12-2**

Pulverizing Equipment

Use of cemented carbides in wear-proofing pulverizing equipment discussed in Bulletin WR-107; includes details on applications, photomicrographs of cemented carbides, and table of standard and special tip shapes for pulverizing blades and hammers. Well illustrated. **Carboloy Dept.** of General Elestric Co., Detroit 32, Mich. **L-12-3**

Machine Tools

Complete story on their many machine tool attachments and accessories offered in illustrated Catalog 5321C, "165 Reasons Why" which gives an over-all view of the job range possible with the many items. Includes specification and price lists for each item. **South Bend Lathe Works,** South Bend 22, Ind. **L-12-4**

Aluminum

Illustrated 20-page booklet covers company's 64 years' work in aluminum; also offers technical data on five basic aluminum alloys, giving the characteristics, applications and advantages; includes comparison tables. **Scovill Mfg. Co.,** Waterbury, Conn. **L-12-5**

Steel Hardening

Pocket-size illustrated 64-page booklet presents detailed information on Super Scottsonizing, a method of hardening precision stainless steel parts that will meet excessive wear; explains method and procedure followed to prepare machined and cast parts for this process. **C. U. Scott & Son, Inc.,** Rock Island, Ill. **L-12-6**

Lubrication

Illustrated 56-page "Lubriplate Data Book" contains general product data, including specifications concerning properties, principle uses and advantages for both grease and fluid type lubricant. Also gives recommendations for product's uses in connection with various equipment. Lubriplate Div., **Fiske Brothers Refining Co.,** Newark 5, N.J. **L-12-7**

Inclinable Presses

Metal Treating

Brochure explains "Electrolizing," what it is and what it involves; numerous case histories expand details of method by outlining various applications, emphasizing advantages brought about by in increased life and efficiency for metal parts. **The Electrolizing Corp.**, 1505 E. End Ave., Chicago Heights, Ill. **L-12-8**

Bearings

Illustrated brochure explains construction, application and advantages of split roller bearings in both standard range and special designs. Discusses proper selection and maintenance. Includes tables of specifications and engineering diagrams. **The Cooper Split Roller Bearings Corp.**, Pittsburgh, Pa. **L-12-9**

Materials Storage

Photos and drawings help explain main points of consideration regarding the flexible Paltier system for materials storage of crushable or irregular shaped items. **The Paltier Corp.**, 1701 Kentucky St., Michigan City, Ind. **L-12-10**

Cut-Off Wheels

Revised booklet "Norton Cut-Off Wheels" contains both new and up-to-date instructional information on various types of cutting-off machines and abrasive cut-off wheels, their selection, application and usage; photos show typical operations; includes data and specifications tables. **Norton Co.**, Worcester 6, Mass. **L-12-11**

Metal Washing

Leaflet describes non-corrosive, ferrous metal cleaning concentrate, Compound 103, explaining principle under which it acts and outlining special data pertinent to its use. **Ipsen Industries, Inc.**, 715 S. Main St., Rockford, Ill. **L-12-12**

Mica Machining

"From One Designer to Another" offers how-to-do-it type information on designing parts to be machined from Mycalex glass-bonded mica, written in shop language; contains tables, specifications charts and workbench sketches. **Mycalex Corp. of America**, Clifton, N.J. **L-12-13**

Carbide Tools

Catalog offers complete information and specifications plus illustrative displays of 40 different carbide tipped tools; also includes pertinent engineering information and a carbide grades chart. Request on company letterhead direct to **Chicago-Latrobe**, 411 W. Ontario St., Chicago 10, Ill.

New 32 page Catalog...
Yours upon request

TRAUB
Single Spindle Automatic Screw Machines
19/32" • 13/16" • 1" • 1½"
Turning & Copying Automatics with Swiss-Type Guide Bushing
19/32" • 13/16"
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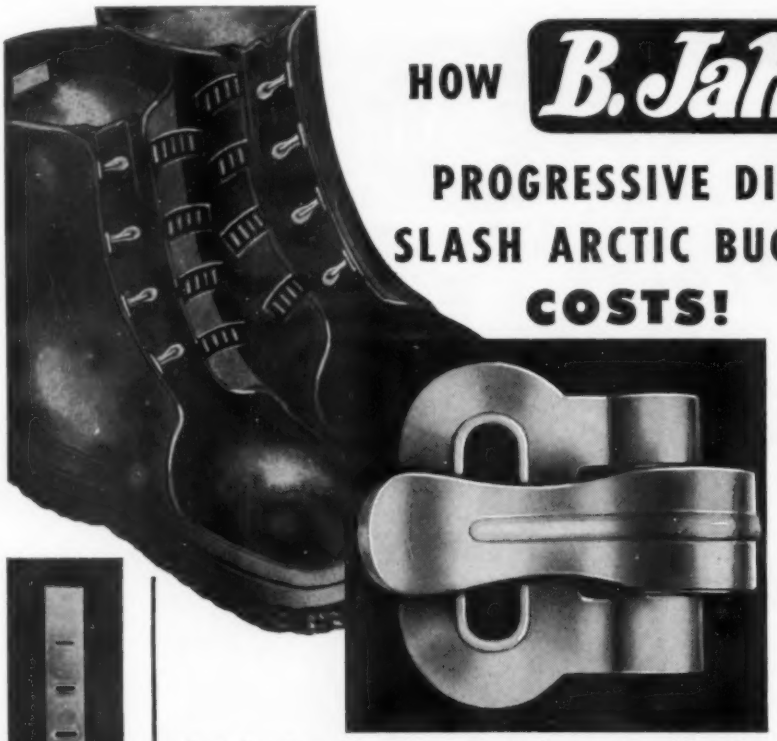
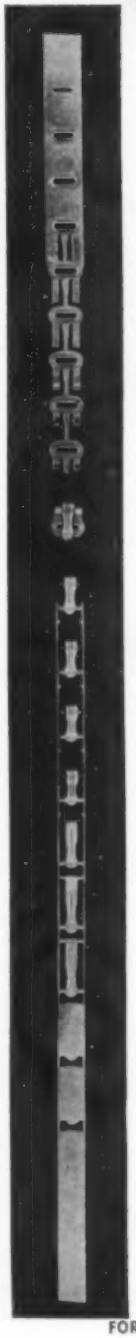
ESTABLISH YOUR OWN



HOW B. Jahn

PROGRESSIVE DIES SLASH ARCTIC BUCKLE COSTS!



Intricate dies by B. Jahn actually form and assemble 140 buckles—complete with "snap"—per minute!

The production of low cost arctic buckles represents another difficult — seemingly impossible — tooling bottleneck solved by B. Jahn design and engineering ingenuity. Not only was forming required, but permanent assembly as well — complete with spring clip locking feature incorporated into finished assembly.

DIE RIBBONS ILLUSTRATING DIRECTION OF FEED AND COMPLICATED TOOLING REQUIRED. 9 STATIONS ON EACH SIDE OF THIS PROGRESSIVE DIE TERMINATED IN A CUT-OFF AND ASSEMBLY STROKE.

The inevitable result — a progressive die — production proved by B. Jahn to deliver 6720 finished buckles per hour — all identical — each ready for assembly line use.

To guarantee the die's performance in customer's equipment to his complete satisfaction, more than 25,000 buckles were submitted for gauging and assembly line use before the die was certified "Production Proved" and shipped. Not only arctic buckles, but countless components from typewriter keys to carbine clips, cameras to loudspeakers can be mass produced IN LESS TIME, AT LESS COST, TO FINER FINISHES WITH B. JAHN PROGRESSIVE DIES.

SEND NOW FOR FACTUAL, PICTORIAL BROCHURE—"The Story of B. Jahn Production Proved Dies".

B. Jahn

THE B. JAHN MANUFACTURING COMPANY • NEW BRITAIN, CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-158

Inclinable Presses

Text and illustrations used in 19-page publication to discuss long slide principle, construction features and replacement parts of V & O inclinable presses; four pages are devoted to specification charts and diagrams point out important dimensions. First in a series of catalogs. **The V & O Press Co.**, Div. of Emhart Mfg. Co., Hudson, N.Y.
L-12-14

Carbide Grinding

"Grinding Cemented Carbides" offers 39 pages of information, with photos and diagrams, on new techniques and abrasive products developed for efficient and economical carbide tool manufacture and maintenance; wheel recommendations for specific grinding problems application as well as an objective appraisals of advantages and limitations of use of green grit and diamond grinding wheels included. **The Carborundum Co.**, Niagara Falls, N.Y.
L-12-15

Extrusion Presses

Bulletin 14.9 presents company's horizontal extrusion presses designed for aluminum, brass and other non-ferrous metals, emphasizing special features and advantages particularly in increased production and performance. Well illustrated. **Lake Erie Engineering Corp.**, Box 68, Kenmore Station, Buffalo 17, N.Y. **L-12-16**

Metal Finishing

Illustrated brochure, offered as aid to metal processors and finishers, lists 33 of company's products; comprehensive application chart helps in selection of correct chemical for specific operations and includes discussion of surface preparation of ferrous and non-ferrous metals. Catalog also describes firm's laboratory facilities for compounding special chemicals for unusual conditions. **Klem Chemicals, Inc.**, 14401 Lanson Ave., Dearborn, Mich. **L-12-17**

Threading

Recently revised "Heat Treated Threading Heads" Bulletin F-90-2 gives detailed data on company's standard and special heat treated heads; includes illustrations and complete specifications. **Landis Machine Co.**, Waynesboro, Pa.
L-12-18

Tool Holder

Illustrated circular explains design, operation, applications and advantages of Brookfield tool holder emphasizing its speed, efficiency and alignment accuracy. **Brookfield, Inc.**, 755 Boylston St., Boston 16, Mass. **L-12-19**

North East West South IN INDUSTRY

Metalworking Processes

Comprehensive study of products and production methods of seven divisions of company presented in publication, "Metal at Work," offered as kind of basic primer in metalworking processes; step-by-step photographs accompany explanations of details of manufacturing processes of each unit covered, described as it is followed through the complete production cycles. Address inquiries on company letterhead directly to **Continental Copper & Steel Industries, Inc.,** 345 Madison Ave., New York 17, N.Y.

Barrel Finishing

Thirty-two page handbook deals with Lorco compounds for descaling for various methods of metal finishing; outlines industrial purposes, characteristics, uses, special advantages and field data; application index furnishes quick reference to help find particular compounds recommended for various applications. Illustrated. **Lord Chemical Corp.,** 2068 S. Queen St., York 9, Pa. **L-12-20**

Meehanite

Thirty-six page Bulletin 42 deals with "Meehanite Metal As a Gear Material;" describes and illustrates many Meehanite gear applications as well as giving details on gear casting design. Includes outlines of engineering properties of both types of Meehanite metal used in gearing and other gear materials. **Meehanite Metal Corp.,** 714 North Ave., New Rochelle, N.Y. **L-12-21**

Magnesium

Folder introduces information on magnesium in rolled plate and sheet form in "Magnesium Plate and Sheet To Reduce Weight" describing dimensions, tolerances etc., of various grades; tables compare gages required for equal stiffness in sheet magnesium, aluminum, brass and steel. **Brooks and Perkins, Inc.,** 1980 W. Fort St., Detroit 16, Mich. **L-12-22**

Lathes

Latest features in line of lathes and lathe accessories and shaper and accessories described in illustrated catalog. Request on company letterhead directly to **Logan Engineering Co.,** Lathe Div., Lawrence and Lamon Aves., Chicago 30, Ill.

Coolant Pump

Compact data and information folder on company's "Baby Gusher" coolant pumps offers details on sizes and models for small machine tools. **Ruthman Machinery Co.,** 1817 Reading Rd., Cincinnati, Ohio. **L-12-23**

ESTABLISH YOUR OWN
BUREAU OF STANDARDS
with this
PRATT & WHITNEY
System

THE ULTIMATE IN
Precision
GAGE
BLOCKS

ACCURACY CONTROL
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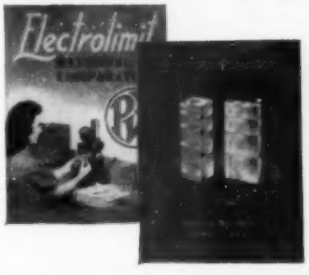
BEST because they're —

- **MORE ACCURATE** in SIZE FLATNESS and PARALLELISM
- **HARDER** — to resist wear and preserve accuracy
- **MORE STABLE** — for more dependable accuracy under all conditions.
- **WIDE SELECTION . . . HOKE and USA Styles in SOLID CARBIDE or STEEL** — obtainable in a variety of sets, or individually as replacements.

BEST because it provides —

- **DIRECT READING to .000001"**
- **110,000X MAGNIFICATION and an 11" SCALE** — for fast, easy, accurate reading.
- **HIGH PRECISION and EXCELLENT REPEATABILITY**
- **EXCLUSIVE RECORDING DEVICE** — gives a permanent record of each block tested.
- **ELECTRO-MECHANICAL MEASUREMENT plus ELECTRONIC MAGNIFICATION** — the time-tested and proven P&W Electrolimit principle.

First Choice *for Accuracy*



PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
16 Charter Oak Blvd., West Hartford 1, Conn.

Please send my free copies of the following circulars:
☐ No. 481-3, Electrolimit External Comparators
☐ No. 545, Steel Precision Gage Blocks
☐ No. 532-1, Carbide Precision Gage Blocks

NAME_____
POSITION_____
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CITY_____ ZONE___ STATE_____

MACHINE TOOLS • CUTTING TOOLS • GAGES

executives of The Carpenter

The Wesson Co. and Wesson Metal

Max Jaenchen is now chief consult-

North East West South IN INDUSTRY

Nelson C. Walker has been named director of manufacturing for all plants of Mechanical Handling Systems, Inc. Mr. Walker brings to MHS considerable experience acquired from his previous post as general manager of American Car and Foundry Co.

The appointment of **Henry J. Gardner** as chief engineer has been made public by Airmatic Valve, Inc. Mr. Gardner, who has extensive experience in the field, has omst recently been design development engineer at International Business Machines, Inc.

V. L. Nicoli has been made superintendent of the wire mill at the Buffalo plant of The Colorado Fuel and Iron Corp.'s Wickwire Spencer Steel Div. L. P. McNamara, formerly wire mill general foreman at the same plant, was named to succeed Mr. Nicoli as assistant superintendent of the wire mill.

According to recent announcement, **Donald W. Withrow** has been named methods engineer for Electro Refractories & Abrasives Corp. Mr. Withrow formerly was development and design engineer for Buffalo Pottery Co.

The P. D. Q. (Portage Double Quick) tool holder and adapter line opens a new era in quick change tools. These Portage tools not only mean new speeds in production and set-up time, but increased accuracy as well.

Send for the New P. D. Q. Catalog

PDQ **PORTAGE Double-Quick TOOL CO.**

1054 Sweitzer Avenue • Akron 11, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-160

Thomas R. Rudel, president of the Rudel Machinery Co., Inc., has been elected president of the American Machine Tool Distributors Assn., at that organization's recent annual meeting. Mr. Rudel is a member of ASTE's Greater New York chapter. He also is chairman of the board of Rudel Machinery Co., Ltd., a director of the Avey Drilling Machinery Co., American SIP Corp., and the Henley Machine Co.

Joseph N. Kuzmick has been appointed coordinator, corporation research and development, by Raybestos-Manhattan, Inc. Mr. Kuzmick, who has been associated with Manhattan Rubber Div. for more than 30 years will make his headquarters at Passaic, N. J., though his duties will extend to all divisions of the corporation.

Two appointemnts recently made at Crucible Steel Co. of America concern **Lorin L. Ferral,** who became assistant vice-president of the company, and **David I. Dilworth, Jr.,** who was made director of metallurgy, the position made vacant by Mr. Ferral's appointment. Mr. Dilworth had been assistant director of metallurgy.

Five engineering promotions have been made public by Worthington Corp. **Everett C. Schmactenberg** was named chief engineer of the turbomachinery engineering services. **C. J. Tullo** succeeds Mr. Schmactenberg as chief engineer of the centrifugal engineering division where he will be responsible for all engineering services on large capacity pumps, vertical turbine pumps, axially split casing pumps, standard and suction centrifugal and refinery pumps. To fill Mr. Tullo's former post as assistant chief engineer of the centrifugal division, Worthington has appointed **Warren H. Fraser.** Mr. Fraser, who has been with the company since 1944, will be responsible for engineering services on large capacity and vertical turbine pumps. **William C. Krutzsch, Jr.,** was also appointed assistant chief engineer of the centrifugal engineering division, and will be responsible for all standard pumps. Mr. Krutzsch has been a product design engineer in the division. **Max Reimer** has been named chief draftsman of the Harrison Works engineering department and manager of the engineering services division. He has been chief draftsman of the centrifugal engineering division since 1947.

Three executives of The Carpenter Steel Co. have been elected vice-presidents by the firm's board of directors. Arlington **A. Britton, Jr.**, who has been general superintendent of the Reading mill, will serve as vice-president in charge of production. **John Moxon**, previously secretary and treasurer of the firm, is now vice-president, treasurer and secretary. **H. Sturgis Potter**, formerly general sales manager, was made vice-president in charge of sales of the main Reading plant.

Thaddeus Augustyn has been named vice-president of the American Research Corp. To assume his present post, Mr. Augustyn resigned as works manager of Boswer Technical Refrigeration where he was considered a pioneer in the development of environmental test equipment since 1946.

Thaddeus Augustyn

C. W. Humphreys

Recent appointment of **Cecil W. Humphreys** to the position of vice-president in charge of manufacturing has been announced by Shell Chemical Corp. Mr. Humphreys has previously been general manager and manager of development for the company's manufacturing department.

Union Carbide and Carbon Corp. has announced appointment of **Raymond W. McNamee** to manager of research administration, where he will help coordinate research activities of all of the corporation laboratories where basic research and development is being done on alloys, chemicals, cases, barbons and plastics. Succeeding Mr. McNamee in his former position of superintendent of the research and development department of Carbide and Carbon Chemicals Co., a division of Union Carbide, is **Franklin Johnston.** Dr. Johnston, who joined the Chemicals company in 1933, has been assistant director of research. In his new post, he will be in charge of the research center at South Charleston, W. Va. At the same time, **Henry C. Chitwood,** former research group leader, was named to the position of assistant director of research—organic chemicals. Dr. Chitwood has been with the company since 1934.

The Wesson Co. and Wesson Metal Corp. have announced the creation of an Experimental Research and Product Development Div., and have named **William Bades** as vice-president to head the new department. Mr. Bader, who had considerable experimental experience both in Europe, and South America before coming to the United States, has been associated with Wesson since 1947 where he has been most recently concerned with product development.

Max Jaenchen is now chief consulting engineer of the Mannesmann-Meer Engineer & Construction Co. In this capacity, Mr. Jaenchen will also supervise installations of Mannesmann-Meer mill machinery.

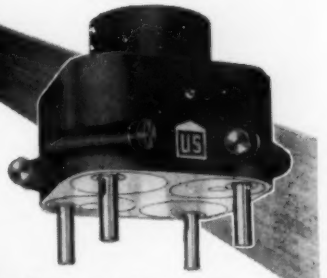
The Pivot Punch and Die Corp. has announced the appointment of **James G. Deckert** as secretary of the firm and also as a member of its board of directors. Mr. Deckert has been comptroller of Pivot Punch for the past year and a half.

...to protect your investment.... save time, money and labor!

SINCE 1915

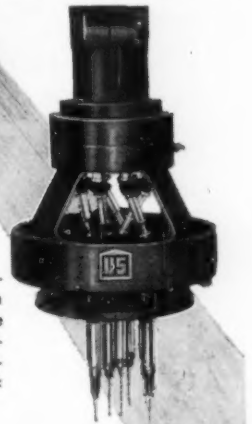
US HEADS

U. S. drill heads are built for continuous use, with full anti-friction bearing construction, for high capacity thrust leads . . . precision-bored, outboard spindle support plate.



Single eccentric type for equally spaced holes on bolt circles.

New double eccentric AdjUStafix, two to eight spindles, for any adjustment. Eliminates the expensive change in set-up from job to job by simply changing the drill pattern plate and relocating spindles. Fully automatic lubrication for either horizontal or vertical operation.



The universal joint adjustable multiple spindle type, an adaptation of a universal joint adjustable spindle, is suitable for any sensitive drilling machine. Joints self-lubricating. Designed for quick change.

We manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.

UNITED STATES DRILL HEAD CO.,
616-618 Burns St., Cincinnati 4, Ohio

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Field Notes . . .

Business and assets of Parker-Kalon Corp. have been acquired by General American Transportation Corp. of Chicago through purchase of capital stock. According to the announcement which revealed the transaction, the business will be operated as the Parker-Kalon Div. of General American. Management personnel of Parker-Kalon at the time of the change will continue in control of its operations and sales.

A continuous processing line of unusual design for beryllium coils and rods has been completed and started into production at the plant of Beryllium Corp. of America according to an annonucement by Continental Industrial Engineers, Inc. Construction is for continuous, low labor automatic operation with exacting control requirements on temperature uniformity, surface treatment and closely timed quenching. It will handle coils up to 36 inches in diameter, and bars up to a maximum of 2½ inches in diameter by 20 feet long at the rate of about 2000 pounds per hour. Since handling and controls are automatic, metallurgical management can present speeds, cycles and transfers for precise results.

V V V

A system designed to offer help to small businesses and industries in the form of technical aid has been operating in the organization of the Small Business Administration set up by the U.S. Government. The organization is under the direction of William D. Mitchell as administrator.

Many small firms cannot afford to employ specialized engineers to help them solve their difficulties, and find it hard to get expert assistance. Though the SBA cannot begin to offer direct help to these small businesses, it can act as diagnostician for firms with particular problems by directing them to authorities in specialized fields, or, on occasion, even confering with representatives of the companies in an effort to suggest a proper course of action.

Primarily, however, the organization is concerned with publishing periodically technical and managerial aids which have been prepared by qualified authorities, and which have in the past proved highly beneficial by generating self help through cooperation in the business world.

V V V

A century and a half in business is the justifiable cause of celebration for Mackintosh-Hemphill Co. of Pittsburgh who are observing the anniversary of the founding of the Pittsburgh Foundry in 1803. During the years, though corporate and partnership names have altered several times, the firm's history traces activities which include making of cannon and shot for Perry's battle on Lake Erie, and the making of ordnance for every war since that of 1812: and the building of the first locomotive assembled west of the Alleghenies.

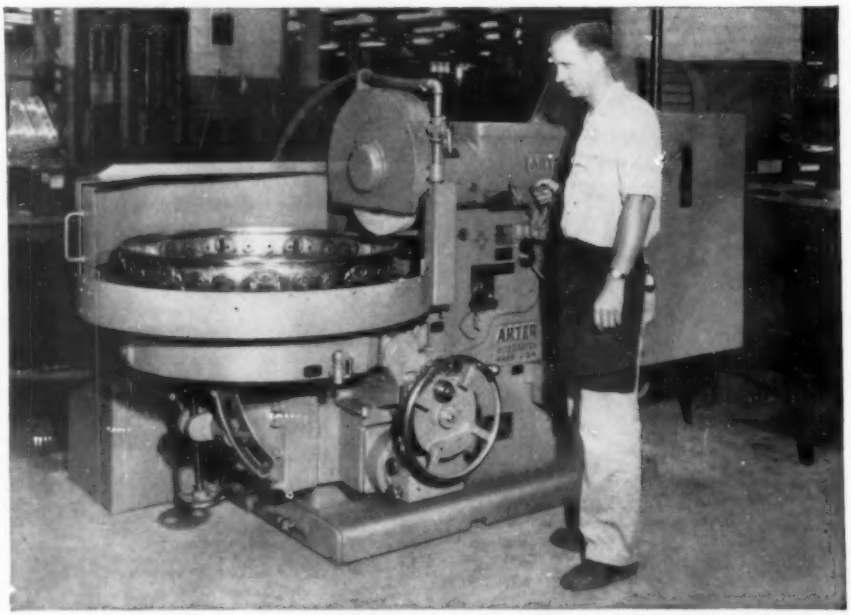
V V V

Ownership of the industrial abrasive-belt grinder division of the Porter-Cable Machine Co. has been transferred to the Engelberg-Huller Co,, Inc. This is the second major purchase made by Engelberg Huller within the past year, having bought earlier the complete Rome Machinery Sales and Engineering series of polishing lathes and automatic buffing and polishing equipment.

Plans for integration of the new lines includes availability of the Porter Cable machines and accessories as presently known, John T. Schenck, Engelberg president stated.

ARTER *Precision*

ROTARY SURFACE GRINDERS



ARTER MODEL B 40" ROTARY SURFACE GRINDER grinding an important part for the latest jet engine. Flat, parallel surfaces are required. ARTER has been building Surface Grinders for work requiring the utmost precision for flatness, size and finish for more than thirty years.

ARTER ROTARY SURFACE GRINDERS are made in sizes from 8" to 40" chuck capacity.

Write today for complete details and specifications

Arter GRINDING MACHINE CO.

WORCESTER 5, MASSACHUSETTS

Rotary Surface Grinders, Cylindrical Grinders, Flat Circular Cutter Grinders, Internal Grinders, Carbide Tool Grinders

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-162

KELLER Air Tools

Acquisition of the Die Supply C-

Approximately a 300 percent increase in titanium production for the first six months of 1954 is expected at the Midland, Pa., plant of Rem-Cru Titanium Inc. The forecast was made by C. I. Bradford, vice-president and director of operations of Rem-Cru, at groundbreaking ceremonies marking the first step in the company's planned expansion program. It is anticipated that by the early part of the year, the firm will be turning out 10 ingot-tons of titanium per day as compared with the present rate of 3 ingot-tons per day. The company is owned jointly by Remington Arms Co., Inc. and Crucible Steel Co. of America.

V V V

Installation of a major facility for the melting and rolling of zirconium and zirconium alloys has been revealed by Firth Sterling Inc. At the same time, the company made it known that the production will be made available for general industrial use, since it is taking this step without the support of any government agency, and the production therefore will not be committed under any government contract. The vacuum melting furnaces, which have an annual capacity of 360,000 pounds, are being installed at the Trafford, Pa., plant. Zirconium sponge will be converted to zirconium ingots, and made available to industry in the form of billets, bars, rods, strip, sheets, wire and tubing.

Operations at the plant are expected to start by January 1, 1954.

V V V

In the future, The Sheffield Corp. will design, manufacture and market Cavitron machine tools, according to an announcement made jointly by the two companies. Sheffield has exclusive distribution rights for the United States and Canada, and both concerns will join in marketing the machines abroad. According to the agreement, Cavitron, being the originators of the ultrasonic machining process and holders of basic patent rights, will continue to produce the ultrasonic transducers and generators, and will issue licenses for the process through Sheffield.

V V V

Purchase of the Louden Machinery Co. of Fairfield, Iowa, has been made public by the Mechanical Handling Systems, Inc., of Detroit. Price was said to be in excess of $2,000,000. According to W. V. Casgrain, president of the Detroit firm, acquisition of Louden will enable his company to expand operations in the field of materials handling equipment and also add new line to the products it now engineers and produces. Operation of Louden will remain at Fairfield.

Two profitable ways you can use Cleveland's Production Service for your Specially Designed Parts
Your non-standard parts can be manufactured *complete* (above) . . . or pre-formed by forging, ready for further shaping and machining in your plant (below). Made by the Kaufman *Double Extrusion* Process, your design is produced with accuracy in dimensional detail—is *stronger* through forging by our process.
Find out how Cleveland can help you in your special parts production. Write for bulletin "Specials by Specialists".
CLEVELAND *Top Quality* FASTENERS
THE CLEVELAND CAP SCREW COMPANY
2944 East 79th Street, Cleveland 4, Ohio
originators of the Kaufman DOUBLE EXTRUSION Process
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KELLER Air Tools

for high speed assembly

ANOTHER EXAMPLE OF

KELLER *Air Tools engineered to industry*

Wherever parts are assembled with screws, nuts, bolts or rivets, the use of Keller Tools speeds up production, reduces costs, and makes work easier.

For example, in assembling record players (shown above), changing to Keller Air Tools made the work easier and faster, and substantially reduced production costs.

Weigh less

Consume less air

Need fewer "back-up" parts in the tool room

Wide variety of handles, gearings, torques, speeds

FACTS IN BRIEF

ABOUT KELLER PNEUMATIC SCREW DRIVERS

Interchangeable parts

Reduce operator fatigue

Clutches, socket drivers, 45° and 90° attachments for every purpose

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Keller Tool Company, Grand Haven, Mich.

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City_____ Zone_____ State_____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-164

Acquisition of the Die Supply Co. has been announced by E. W. Bliss Co. Former Die Supply officials who will continue with the organization include John R. Fitzsimmons, founder, who will remain as chairman of the board; Warren Fitzsimmons, former president, who becomes factory manager; and Carl J. Theken, former comptroller, who will be assistant secretary and assistant treasurer. H. U. Herrick is the newly elected president, and J. H. Tredinnick the executive vice-president.

V V V

First seamless tube mill west of the Mississippi is now in operation by The Colorado Fuel and Iron Corp. The $30-million mill, located at Pueblo, Colo., will be an important supplier of seamless steel tubing and casing to industries of the West, and is recognized as a big step forward in the industrial growth of the area.

V V V

Carbide form tool grinding equipment and personnel of Corlett-Turner Co. have been acquired by Spiral Step Tool Co. of Chicago. With this procedure, Spiral makes its entry into the carbide form tool field on a broad production scale, rather than to the limited extent of the past. With the acquisition of Corlett-Turner equipment and grinding method for grinding carbide, Spiral has expanded facilities to the point where all demands for screw machine cutting tools can be met.

V V V

In order to improve manufacturing facilities and increase their production, James H. Knapp Co., the West Coast's oldest designer and manufacturer of industrial furnaces has built a new plant at 1731 Workman St., Los Angeles, Calif. Four buildings house the shops, engineering and administrative offices, covering about half the 151,000 sq. ft. of space in the new location, with the remainder used for fabrication yards.

V V V

Formation of a new engineering section within the atomic equipment department has been announced by the Westinghouse Electric Corp. The section will be responsible for a development, design and test program involving equipment for nuclear power plants. According to William C. Miller, manager of the corporation's atomic equipment department, who made the announcement, the development program will be aimed toward improvement of certain plant components and specific items of equipment, other than pumps, associated with nuclear power plants.

Edward J. Kreh, formerly section manager in the power plant department of the Atomic Power Div., will head the new section.

good reading

MACHINE TOOL SELLING *by Harry J. Loberg. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York, N.Y. Price $5.00. 194 pp.*

This manual was written to improve selling techniques for machine tool salesmen and to enable them to check their present selling methods.

Covered are all phases of selling, buying motives, customer approach, the interview, sales presentation, handling customer objections, closing and following through the sale, and other methods and techniques. The legal aspects, based on actual cases, are also discussed.

TOOL ENGINEERS' DATA BOOK *by Gerhard J. Gruen. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. Price $5.50. 219 pp.*

This work gives the tool or shop engineer easy access to tables, specifications, formulas and constants for which he is accustomed to search through several volumes. The book has been prepared with a minimum amount of explanation and footnotes, assuming the practicing engineer is able to understand the material presented. A special effort has been made to cover the latest developments.

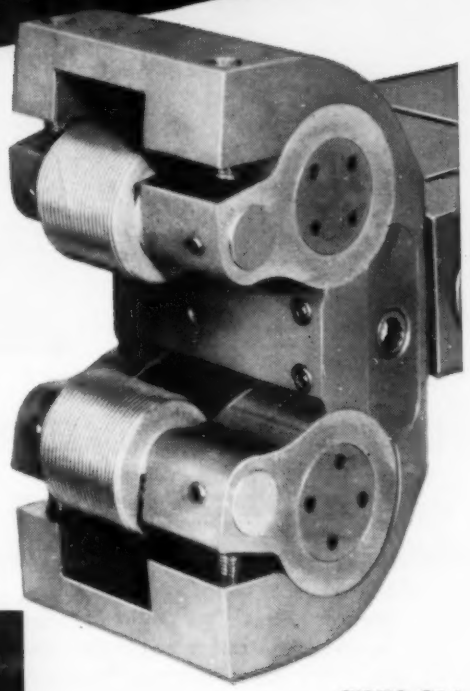
MEASUREMENT TECHNIQUES IN MECHANICAL ENGINEERING *by R. J. Sweeney. Published by John Wiley & Sons, Inc., New York, N.Y. Price $5.50. 309 pp.*

Presented here is a ready source of information on the common measurement techniques used in the performance testing of power equipment—engines, pumps, compressors, and combustion and heat transfer apparatus. The book establishes insight into the principles on which instruments are designed, and understanding of the difficulties involved in obtaining correct measurements of physical quantities with the types of instruments available. Seldom found methods for estimation of error in temperature measurements are presented in compact and concise terms.

REED RTD

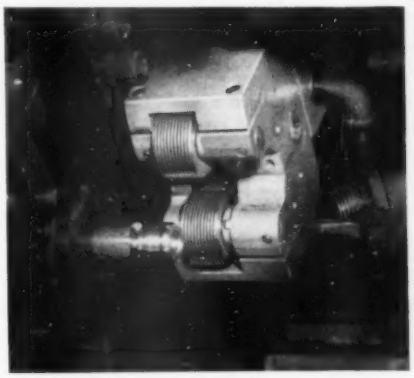
Four Standard Thread Rolling Attachments

For more than 100 Sizes of Automatics



SERIES G2A

Operating from the cross slides of automatic screw machines, each size is adjustable to accommodate an infinite range of work diameters within its capacity. Maximum thread rolling capacity within the tooling sector of over 100 sizes of single and multiple spindle automatic screw machines is possible through the selection of one of the four standard attachments.



Reed attachments have two opposed rolls which pass over the work when rolling the thread. They are easy to set up and rolls may be quickly changed and adjusted for size. A simple device provides precise matching of the rolls.

The attachment consists of two units, a head and an adapter. The heads are of compact rigid design and are assembled to an adapter by a floating swivel connection. Adapters are of the solid or adjustable type, and are designed for various cross slide positions on the automatics. A large assortment of adapters are available that permit more than 300 cross slide applications.

Send us specifications of your requirements and let us supply you with complete information.

REED ROLLED THREAD DIE CO.

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS
Worcester, Massachusetts, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Detroit, Englewood, N. J., Houston Indianapolis, Milwaukee, Montreal, New York City, Philadelphia, Pittsburgh, St. Louis, Syracuse, Toronto

027

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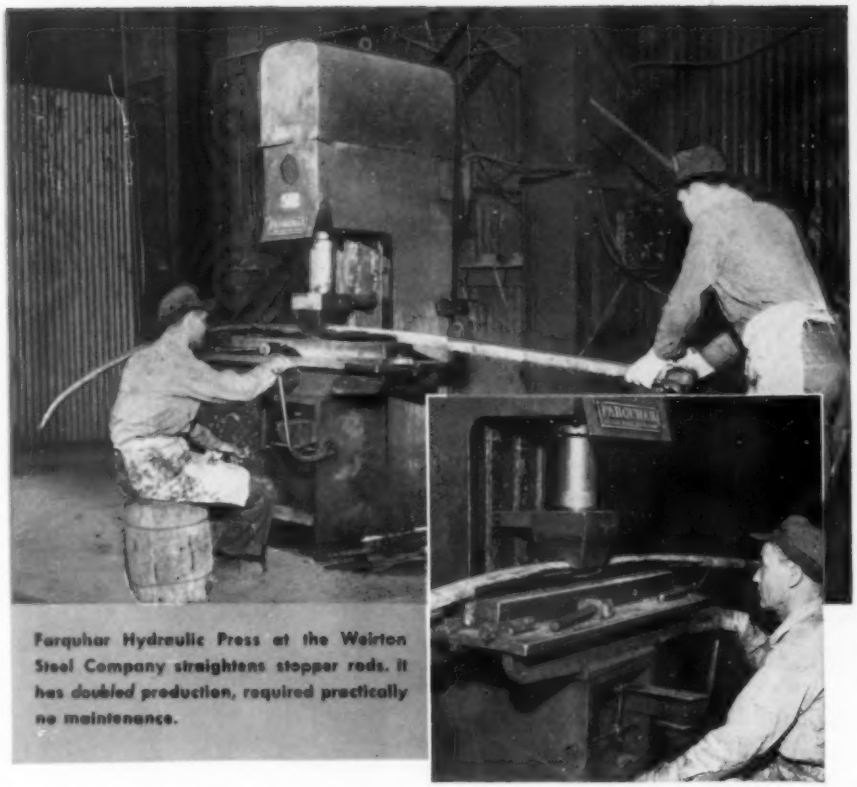
USOP high quality



Farquhar Hydraulic Press at the Weirton Steel Company straightens stopper rods. It has doubled production, required practically no maintenance.

Farquhar Hydraulic Press

at the Weirton Steel Co.

"eliminates breakage of rods... increases production 100%"

The Weirton Steel Co., Weirton, W. Va., formerly straightened stopper rods with a steam hammer. The operation was slow and resulted in a high percentage of breakage. Seeking a better method, Weirton officials bought a Farquhar Press to speed production. Not only has the press increased production 100%, but it has eliminated breakage of rods. In addition, Weirton reports that in the six years this press has been operating, "practically no maintenance has been necessary."

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in modern production! Farquhar Presses are built for the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost.

Farquhar engineers are ready to help solve whatever production problem you may have. Send for free catalog showing Farquhar Built-for-the-Job Presses in all sizes and capacities. Write to THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1506 Duke St., York, Pennsylvania.

Farquhar

HYDRAULIC PRESSES

for Bending • Forming • Forcing • Straightening • Assembling • Drawing
Extruding • Jogging • Forging • and other Metalworking Operations

THE OLIVER CORPORATION, A. B. FARQUHAR Division

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-166

ALUMINUM IN IRON AND STEEL *by Samuel L. Case and Kent R. Van Horn. Published by John Wiley & Sons, Inc., New York, N. Y. Price $8.50. 478 pp.*

This book is the first of a new series of Alloys of Iron Monographs. The first part contains a summary of data showing the favorable effect of small amounts of aluminum when added to molten steel as a deoxidizer. The second part presents a correlation of data on the effect of aluminum as an alloying element in steel. The phenomena of inclusion formation, grain size, notch sensitivity, and aging are extensively treated. Material was drawn from over 340 sources.

Among the subjects discussed by chapter are: the deoxidation of steel by aluminum; the role of aluminum in austenitic grain-size control; effect of aluminum on aging of steel; the manufacture of the simple and complex iron-aluminum alloys; aluminum in heat-resisting alloys; and miscellaneous uses of aluminum as an alloying element in iron and steel.

ATOMIC ENERGY IN INDUSTRY, *Published by the National Industrial Conference Board, Inc., 247 Park Ave., New York 17, N.Y. Price $10.*

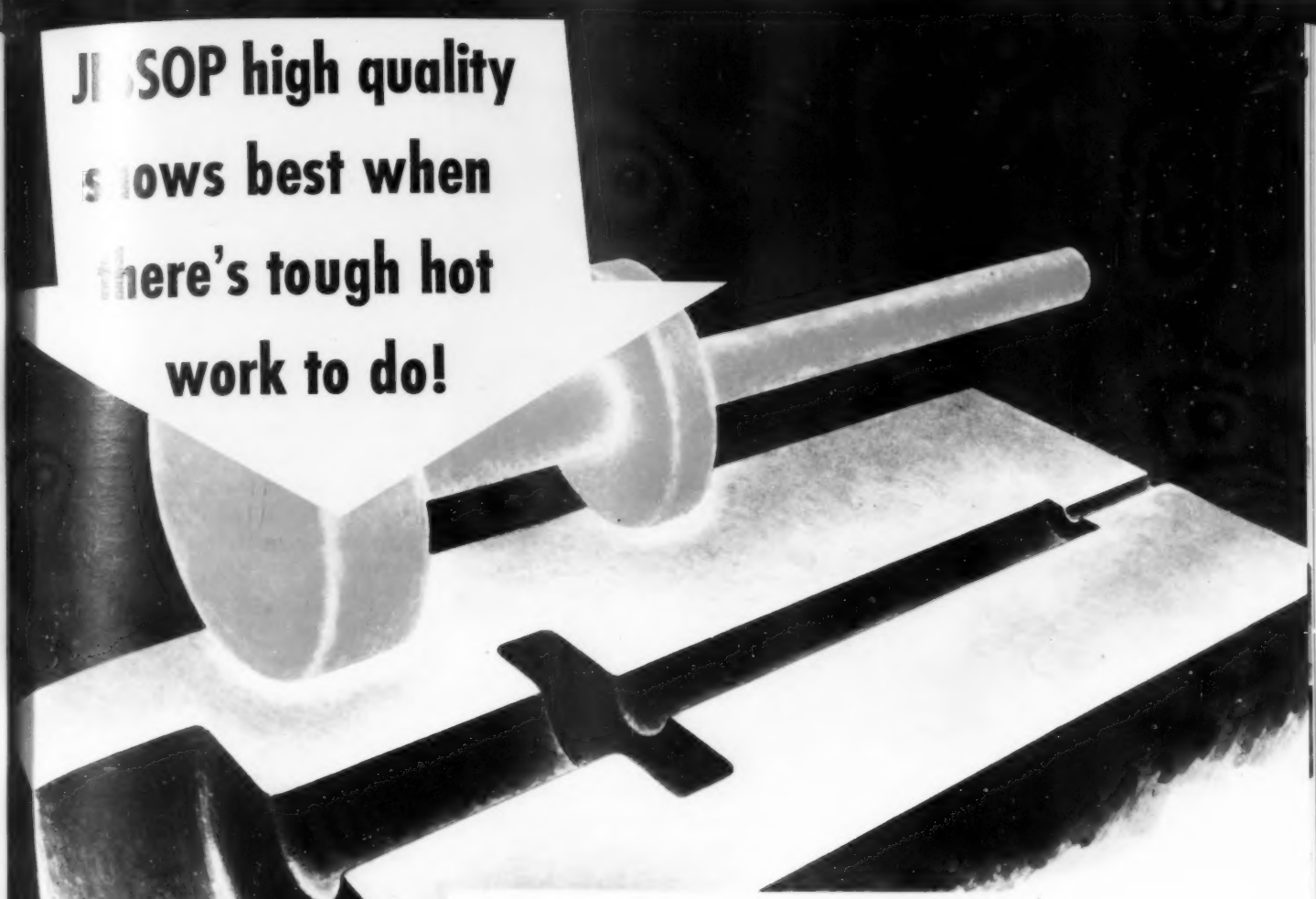
Compiled in this book are the complete minutes of a special conference of the National Industrial Conference Board, Inc., held in October, 1952.

The subjects discussed are: sales opportunities in the atomic field; current applications of atomic by-products in the fields of industry, agriculture, food products, medicine and pharmaceuticals. Also presented is a discussion of the problems of industrial participation and the problems of atomic power development. Illustrated.

SUCCESS THROUGH WELDING, *published by The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio. Price 50-cents. 50 pp.*

This booklet presents the stories of men who have achieved success with small arc welding businesses. Their histories are told not to glorify an industrial process but rather to point out that today there still is opportunity in America for free enterprise, that success comes through perseverance, ability, hard work and individual initiative in thought and action. The booklet contains 140 illustrations.

JESSOP high quality shows best when there's tough hot work to do!



Of all the many types and shapes of steel that make Jessop America's most diversified specialty steel house, none shows its quality in the clinches better than the DICA-B brand hot work steel illustrated here in the form of a die. Jessop is justly proud of this steel because its high quality is easy to measure. For example, if you make dies, knives, punches or tools for any type of die-casting, forming, punching, cutting or extruding of hot ferrous or nonferrous metals, Jessop has a steel for you. Jessop has a carefully controlled analysis to give you extra toughness to resist shock, or extra hardness to withstand abrasion, or extra ability to resist temperature change without checking or cracking—or any combination of these virtues. And beyond matchless quality, the fast, efficient service of the Jessop team will please you no end. To find this out very quickly, send us an order for any of the specialty steels listed here.

- STAINLESS STEELS
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- NON-MAGNETIC STEELS
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- STAINLESS-CLAD PLATES
- CARBON AND ALLOY STEELS
- TOOL STEELS FOR SPECIAL PURPOSES
- CAST-TO-SHAPE TOOL STEELS
- HIGH SPEED AND ALLOY SAW STEELS
- TEMPERED AND GROUND STRIP STEEL
- COMPOSITE HIGH SPEED STEELS
- STAINLESS AND HEAT RESISTING CASTINGS
- COMPOSITE DIE STEEL SECTIONS
- PRECISION GROUND FLAT STOCK
- DIE STEELS— HOT AND COLD WORK

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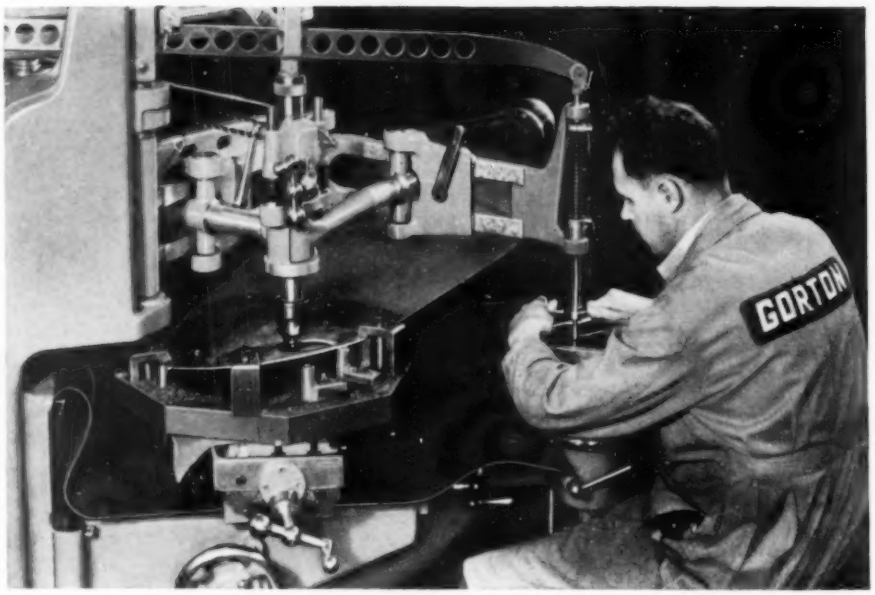
STEEL COMPANY • WASHINGTON, PA.



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW —

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

— in the sense that industry at large and Metal Working people in particular are just beginning to appreciate the many advantages Pantography offers to those faced with the Design-Production problems of today and tomorrow.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

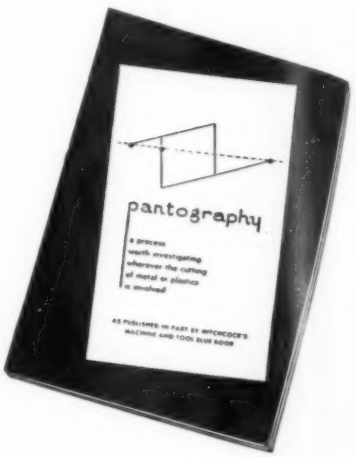
Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

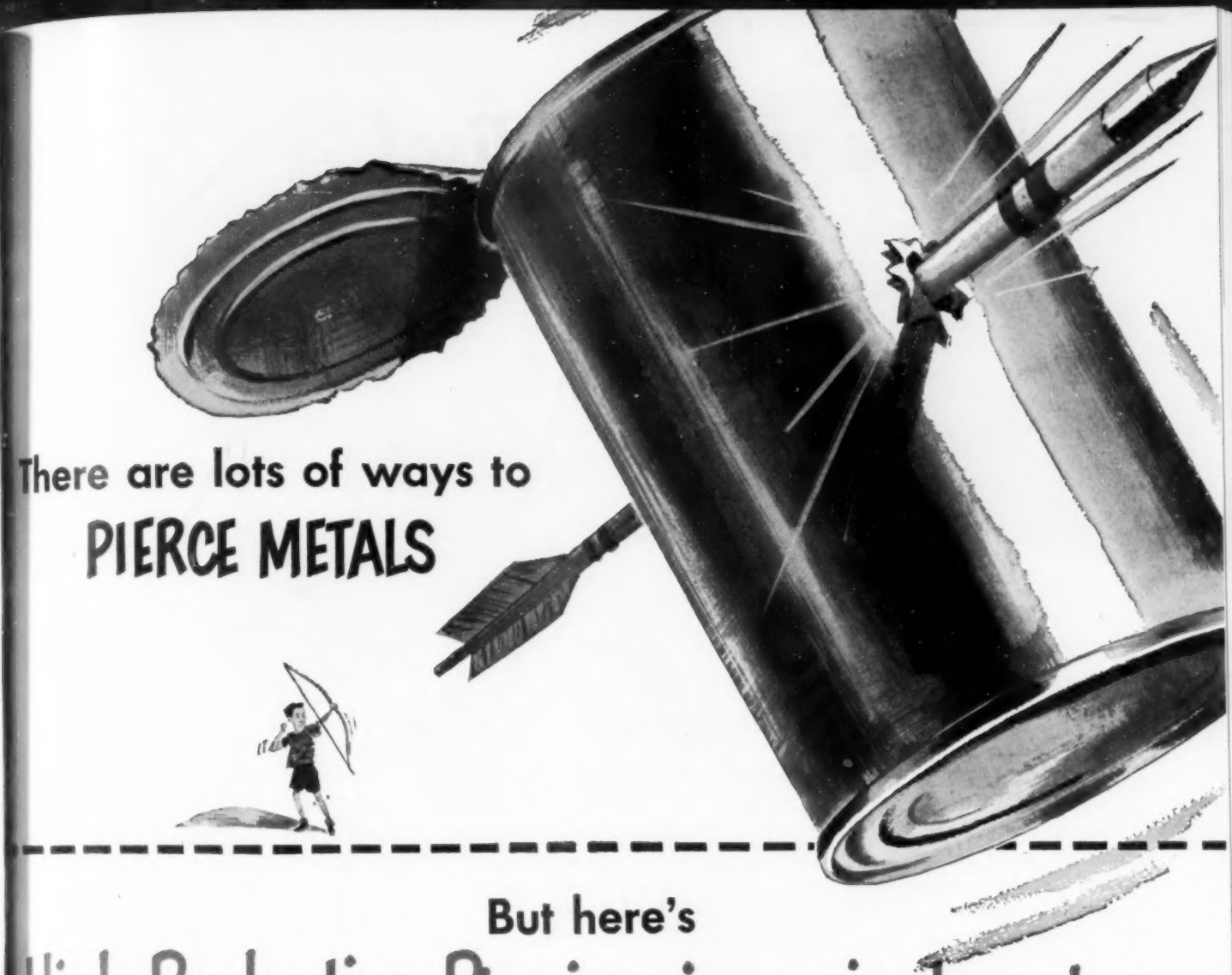
The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 2612 Racine Street, Racine, Wisconsin, U. S. A.





There are lots of ways to

PIERCE METALS

But here's

High Production Piercing in a single set-up

Seven irregular holes and two trimming operations complete this car door inner window frame in one setup. Model changes can be made at low cost.

DANLY HYDRAULIC METALWORKING EQUIPMENT

Now you can pierce multiple holes of practically any type—round, oblong or irregular—to very close tolerances in a single setup. Capacity of Danly Metalworking Equipment can be as high as 225 tons per hole with break-through shock practically eliminated. Each station hydraulically strips its punch, greatly simplifying fixturing. Custom-built for your piece part, Danly Hydraulic Metalworking Equipment enables you to pierce more holes faster and more accurately—in one operation.
Write for the special bulletin shown at right today.

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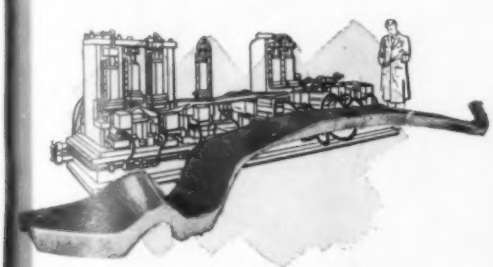
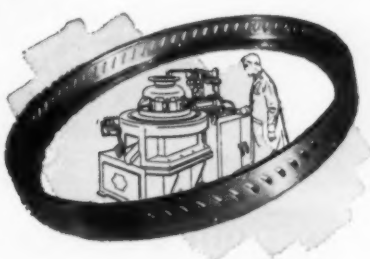


More than 40 holes in this automotive frame member are pierced simultaneously on a Danly machine built expressly for this purpose.

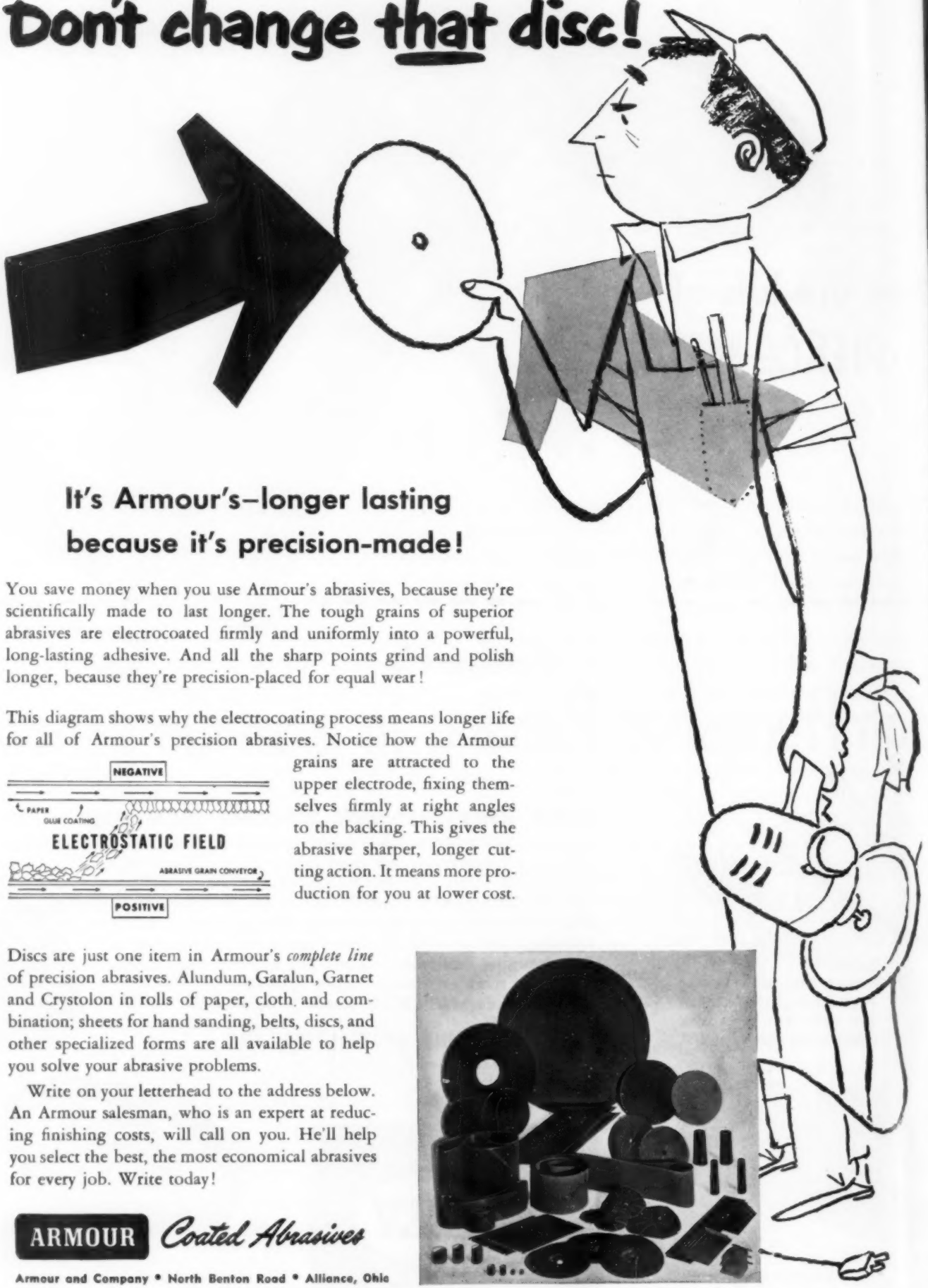
DANLY

HYDRAULIC METALWORKING EQUIPMENT
MECHANICAL PRESSES
... 50 TO 3000 TONS



Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.

Don't change that disc!



It's Armour's—longer lasting because it's precision-made!

You save money when you use Armour's abrasives, because they're scientifically made to last longer. The tough grains of superior abrasives are electrocoated firmly and uniformly into a powerful, long-lasting adhesive. And all the sharp points grind and polish longer, because they're precision-placed for equal wear!

This diagram shows why the electrocoating process means longer life for all of Armour's precision abrasives. Notice how the Armour grains are attracted to the upper electrode, fixing themselves firmly at right angles to the backing. This gives the abrasive sharper, longer cutting action. It means more production for you at lower cost.

Discs are just one item in Armour's *complete line* of precision abrasives. Alundum, Garalun, Garnet and Crystolon in rolls of paper, cloth and combination; sheets for hand sanding, belts, discs, and other specialized forms are all available to help you solve your abrasive problems.

Write on your letterhead to the address below. An Armour salesman, who is an expert at reducing finishing costs, will call on you. He'll help you select the best, the most economical abrasives for every job. Write today!

ARMOUR *Coated Abrasives*

Armour and Company • North Benton Road • Alliance, Ohio

built expressly for this purpose.

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... 50 TO 3000 TONS

High Precision, Reliability, Top Performance

SCHAERER

MODEL UN-450

Heavy Duty Lathe

SCHAERER MODEL UN-450 HEAVY DUTY COPYING LATHES.

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permits rough turning and finish turning in the same operation in many instances. Swings 17-3/4" over bed, 9" over carriage,, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M. Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

OUTSTANDING FEATURES

Copies simultaneously in 2 directions; 49 longitudinal and cross feeds; All gears in headstock hardened and ground; Automatic carriage release when overloaded; Separate oiling systems for front and rear end bearings; Ball stop catch on cross slide guarantees accurate depth adjustment for thread cutting; Adjustable carriage stop for longitudinal turning.

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- *Spare Parts in Stock*
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Half the weight of other knurling tools — *twice as efficient!* Convenient position of the set screw enables you to get to work faster by cutting down setting up time. Set screw locks knurl pin securely, allows knurl changing without removing the holder from the turret.

One HEX WRENCH MAKES ALL ADJUSTMENTS

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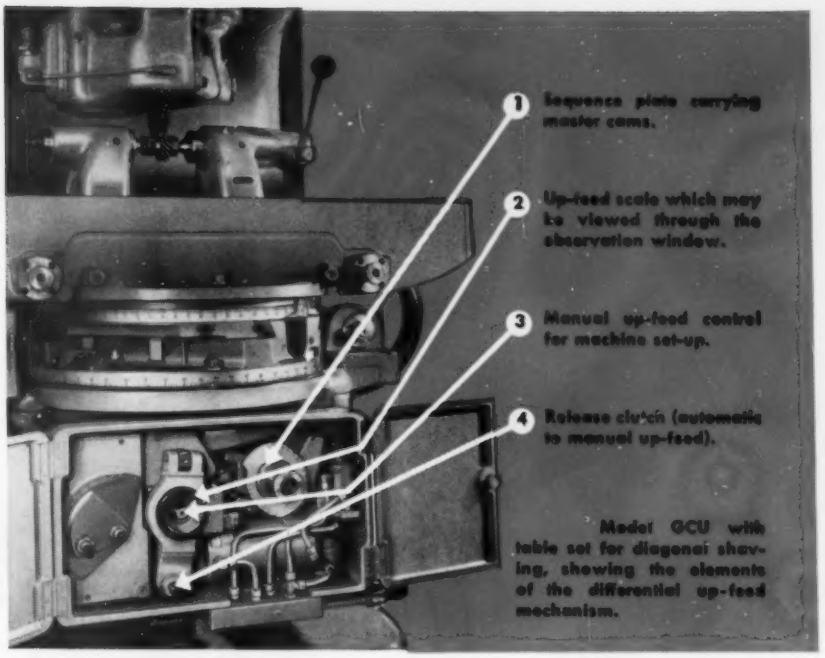
Much Faster and More Flexible


1 Sequence plate carrying master cams.
2 Up-feed scale which may be viewed through the observation window.
3 Manual up-feed control for machine set-up.
4 Release clutch (automatic to manual up-feed).

Model GCU with table set for diagonal shaving, showing the elements of the differential up-feed mechanism.

When Automatic Differential Up-feed and Conventional Crowning were added to the Red Ring Model GCU, shaving speed, flexibility and economy were all significantly increased.

AUTOMATIC DIFFERENTIAL UP-FEED

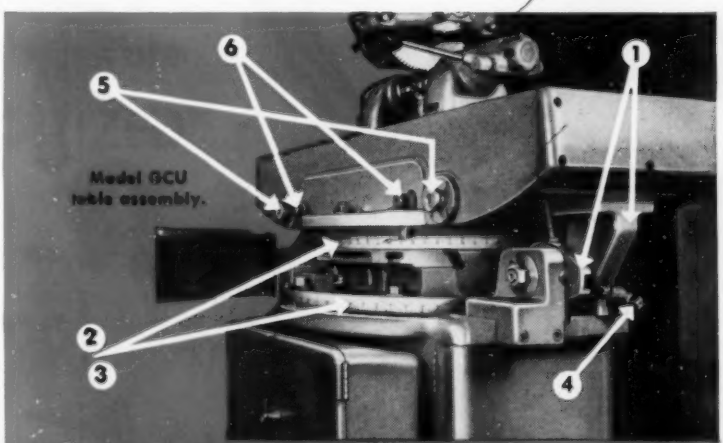
This efficient device provides for the first time an automatic cycle applicable to both diagonal and conventional shaving. This cycle is controlled by an eleven-position master cam. Included are backlash take-up, infeed cutting strokes, idling strokes and return to unloading backlash. The entire cycle or any portion of it may be used depending on job requirements.

The cam itself does not actuate knee movement. It is strictly a stepped gaging device. Consequently every knee movement is positive, extremely precise and very fast. No danger of operator's errors. Perfect accessibility for fast loading and unloading.

One of the two control cams carried by the feed unit sequence plate.

CROWNING

Gears being shaved conventionally can be crowned by rocking the table about a central pivot during the automatic cycle. The cam controlling the rocking movement is located on table centerline to avoid any tendency to twist. This device also provides for taper shaving.



1. Crowning cam and bracket.
2. Scales for diagonal shaving set-up.
3.
4. One of 2 tapered shot bolts used to realign table and ways for conventional shaving.
5. Lock pins when removed, permit table to rock for conventional crowning.
6. Bolts operated from the front of the machine actuate tapered wedges to lock table to the ways.

Write for Bulletin S53-7 for full details.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

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Special Tools of Quality
Engineered to Save Your Time

DETROIT REAMER & TOOL CO.

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THIS TIME... IT'S

XL HIGH SPEED TOOL STEELS*

regular analysis high speed steels

...plus...

NEW SULPHIDE LUBRICANTS

...Additives made possible

by the "DESEGATIZED" process

now available in M-1, M-2 and M-10 types

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*Patent applied for.

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GENEVA BRUSSELS MILAN PARIS ROTTERDAM

Only a Taft-Peirce *Offers these 4*

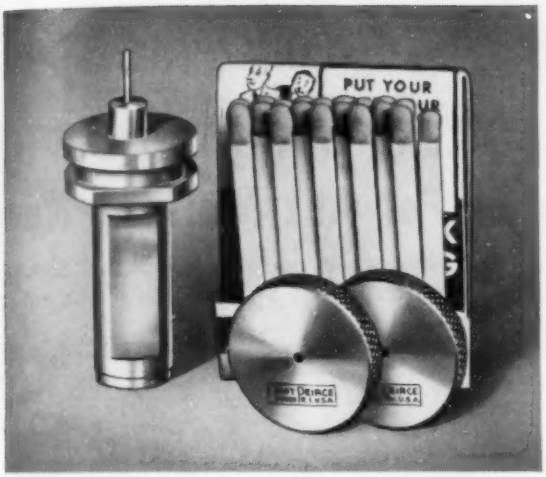
1 Computes Difficult Measurements Automatically

A T-P Computing CompAIRator eliminates the need for two measurements and a calculation. One gage, one dial, measures, calculates and indicates the final answer instantly on the dial face, for such difficult measurements as center distance without respect to hole size, deviation from angle or taper, concentricity, and squareness of bore to face.

The three dial Computing CompAIRator pictured above does the work of six dials in checking bend, twist, and center distance of connecting rods.

THE TAFT-PEIRCE MANUFACTURING

CompAIRator Air Gage
Great Features

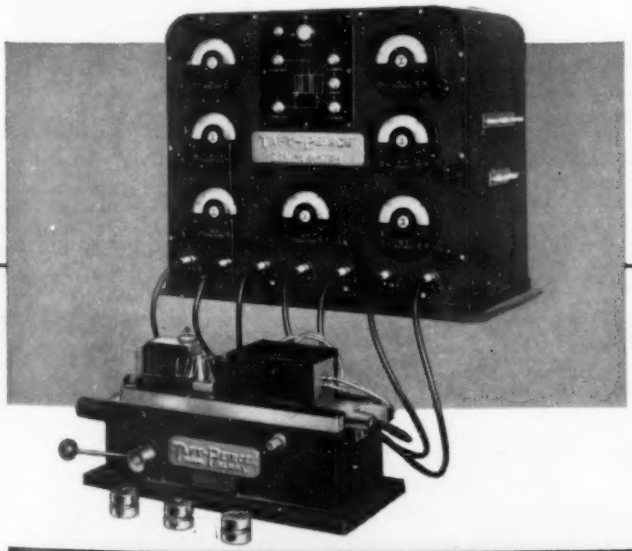


2 Checks Diameters as small as .055″

The velocity-type circuit of a T-P CompAIRator, which permits use of tiny air passages and nozzles, makes these small measurements possible quickly and accurately.

3 Checks Tolerances up to 120 thousandths

T-P CompAIRator air-contact members can be furnished to permit measurements within this wider tolerance range with a standard unit.



4 Gives Simultaneous Signal Light and Dial Indications

A T-P Air-Electric CompAIRator offers the ultimate in speed for multi-dimensional gaging. It provides both exact size on standard dials *and* light indications for oversize, undersize, and within tolerance conditions.

Couple these great features with the greater speed, accuracy, and dependability of a T-P CompAIRator — and you know why thousands use and prefer them. Write for demonstration at your plant. Prove the time and money saving differences for yourself.

T-P means Top Precision

COMPANY, WOONSOCKET, RHODE ISLAND

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Higher production with CADILLAC Dies is assured by special steel selection, controlled heat treatment and precision engraving — noted for accuracy and high quality. We'll be glad to advise you on best marking methods.

PUNCH PRESS DIE

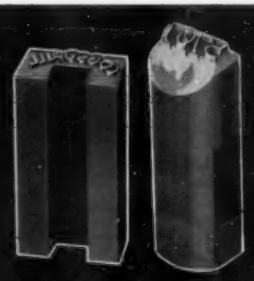
ROLL SEGMENT DIE

SOLID ROLL DIE

HEAVY BEVEL STEEL LETTERS AND FIGURES

The faces of CADILLAC Steel Letters and Figures combine a high degree of hardness with toughness, insuring exceptionally long life. Each stamp is clearly marked with character designation and size. Long tapering bevels assure easy alignment of characters. *(To the right, note CADILLAC's sturdily boxed Interchangeable Steel Type Set.)*

FORGING HAND STAMP



DIE INSERTS

EMBOSSING DIE

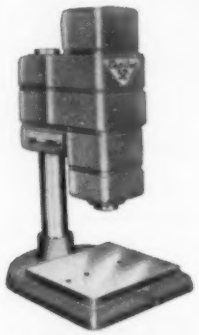
You Don't Need An X To Mark "The Spot"

There Are CADILLAC MARKING DEVICES Designed For ALL Marking Needs

Just as "variety" is called "the spice of life", varieties of marking methods and devices are essential for meeting modern production demands. CADILLAC STAMP COMPANY is equipped to offer or build every conceivable type of marking device, from simple hand stamps to especially created and designed machinery for unusual marking requirements.

CADILLAC 115 HAND MARKING MACHINE

For general purposes this floor type machine gives top service. Marking is done in a rolling operation—requiring minimum pressure. Marks flat or round parts of varying thickness. Foot pedal for marking flat or irregular contoured parts; table screw adjustable for round parts.



CADILLAC 52 AIR IMPACT PRESS

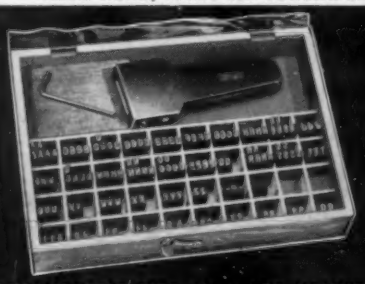
For high speed marking, assembling, branding, staking, crimping, riveting, also for producing light stampings. The 52 effects great savings in production — delivers speeds up to 10,000 strokes per hour—pressure up to 8 tons. Safe to operate, automatic controls. Can be hand, foot or electrically-actuated.

CADILLAC 45 HYDRAULIC MARKING MACHINE

Here's a compact, self-contained, manifold mounted, hydraulic unit. One control gives full range of marking depth. It will mark round, flat and irregular surfaces. Machine capacity is up to 110 one inch impressions per minute.

Machines Above, Write for Bulletin M-120
Misc. Items, Write for Bulletin SE-130.

HAND STAMP NUMERALS



INTERCHANGEABLE TYPE AND TYPE HOLDER SET

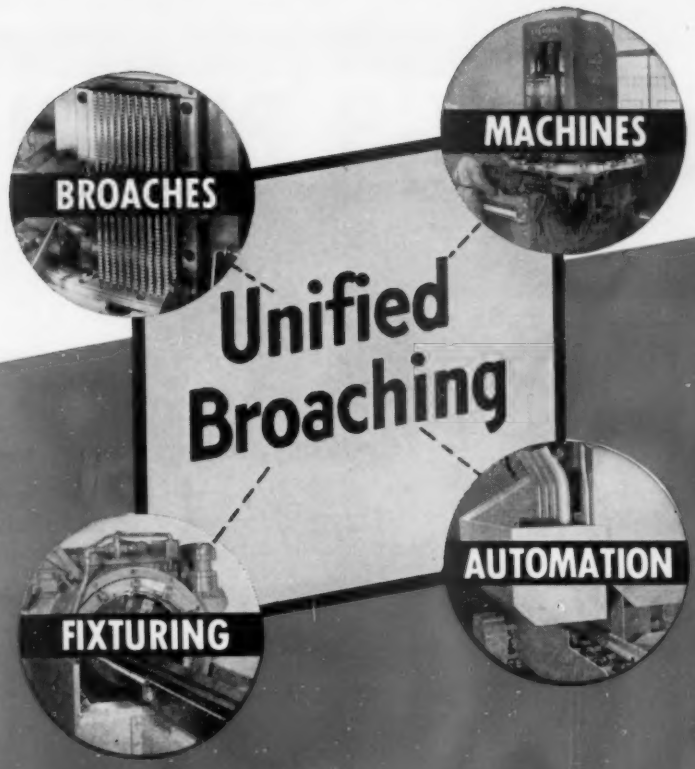
HAND STAMP SYMBOLS

CADILLAC
Marking Devices

CADILLAC STAMP COMPANY

Factory and Offices

17313 Ryan Road • FO. 6-0500 • Detroit 12, Mich.

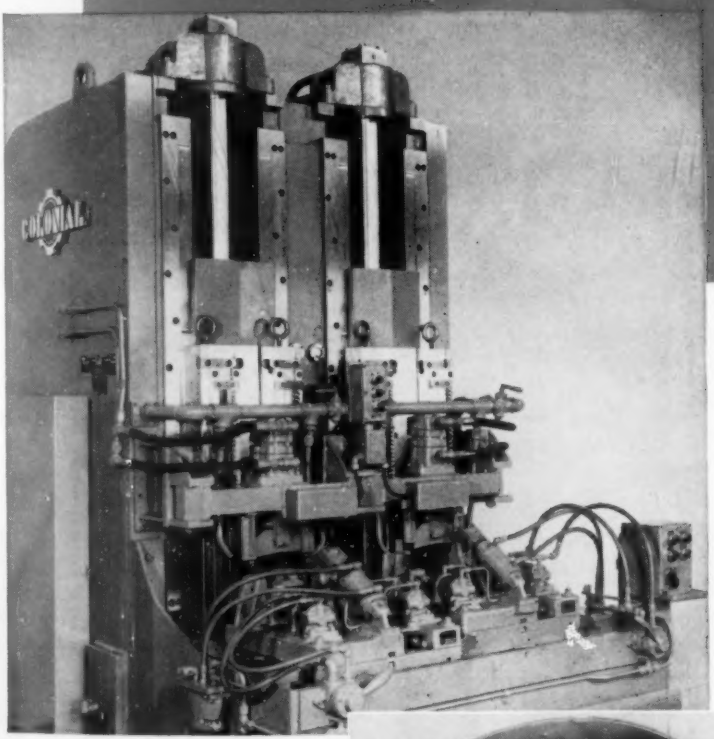


the COLONIAL method

At Colonial, experience, imagination and competence are applied

1 to the design and manufacture of each of the individual components of a complete broaching installation, and

2 to the effective combining of ALL components into a completely UNIFIED BROACHING installation—making them work as a "team."



400 Brake Shoes Broached per Hour

Here a 1/2-inch slot and a 13/32-inch concave are broached at opposite ends of 400 brake shoes per hour. Stock removed is 3/32-inch.

Colonial provided instantaneous pneumatic positioning; automatic hydraulic clamping; two shuttle fixtures; uniform taper insert broaches—all unified on a Colonial dual ram with 54-inch stroke.

WHAT'S AHEAD IN BROACHING?

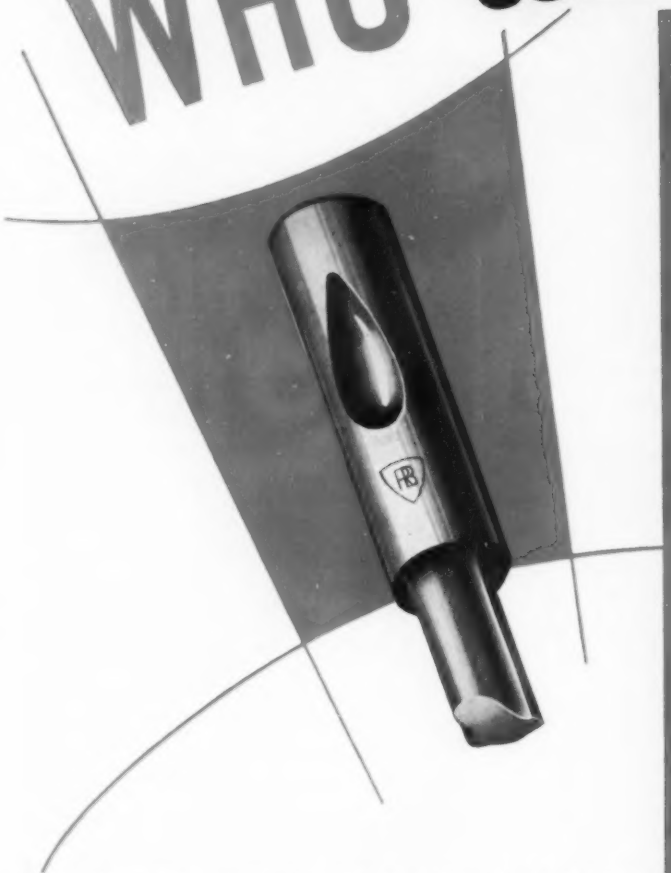
Keep up with the latest developments: Read "Broaching News". We will be glad to see you get it regularly if you will drop us a line on your company letterhead.

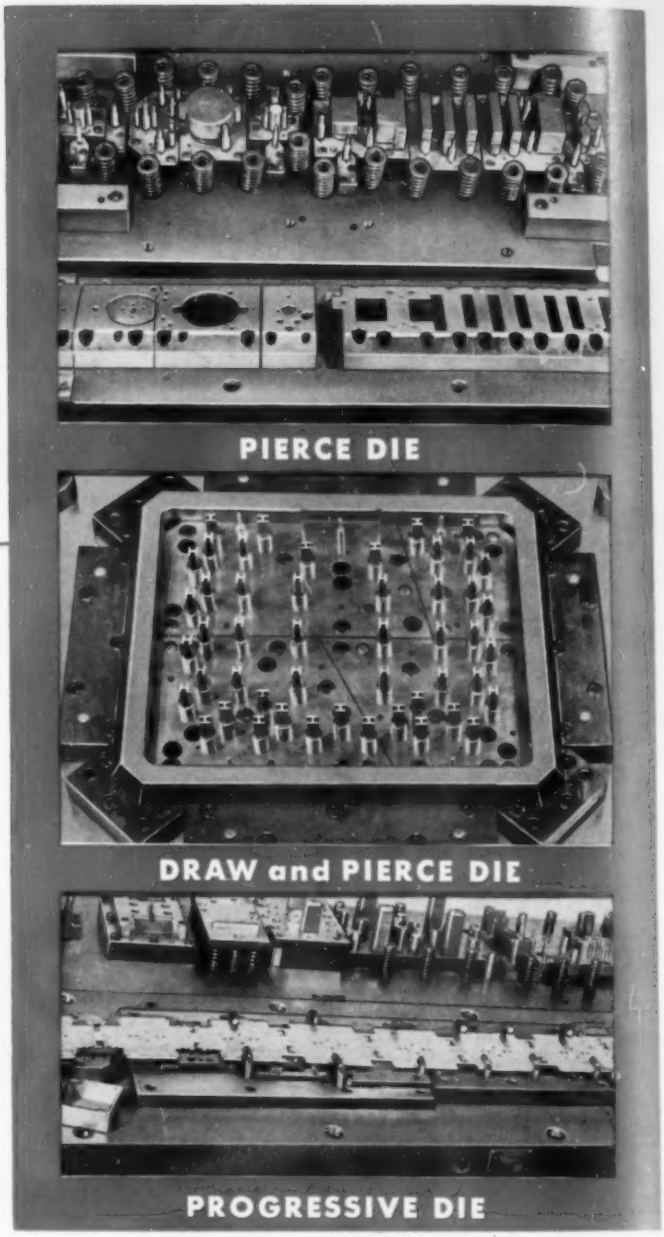
PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

WHO USES R-B PUNCHES





PIERCE DIE

DRAW and PIERCE DIE

PROGRESSIVE DIE

Through many years of providing America's leading industries with interchangeable and standardized punches, die buttons and retainers, R-B has built a reputation for increasing production, lowering costs and saving time. R-B case histories of savings and benefits include users of cam actuated, multi-station progressive, forming, blanking, piercing, embossing and combination dies of all sizes and types.

Why don't you investigate the cost saving features of R-B equipment?

Use R-B Engineering Service for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 77 • 12667 BURT RD. • DETROIT 23, MICHIGAN

Please send me additional information.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

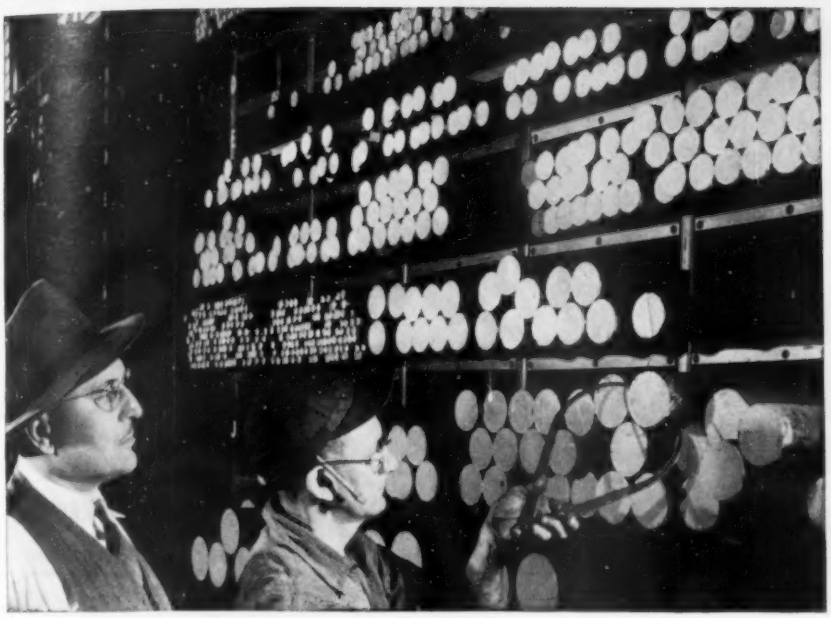
CITY _____ ZONE _____ STATE _____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES
MADE OF FERROUS ALLOYS,
ZINC ALLOYS OR PLASTICS

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation



Bethlehem's large tool steel depot carries a complete range of sizes in 24 different grades of steel, to facilitate rapid shipment to distributors.

Prompt Service?
See Your Tool Steel Distributor

Being Johnny-on-the-spot is but one of many services performed by the tool steel distributor. He knows what's needed in your area, and to make sure your requirements are met promptly, he keeps large stocks of tool steel on hand. You'll find him always ready to lend you a helping hand, too, whether you require a simple operation like cutting bars, or something much more complex, such as determining the kind of heat-treatment needed.

It's all to the good when you have a tool-steel distributor near you, for then it's not necessary to carry large inventories. What's more, the distributor often has a supply of other steel specialties that you may need.

All distributors of Bethlehem Tool Steels are friendly, reputable firms, well known for their good service. They're good people for you to know. Our hat is off to them for a fine job — each and every one.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Use Fresh Water for Quenching Tools

It makes no difference what the source may be—fresh water is simply unsuitable for the quenching of tools. For all fresh water contains dissolved gases, which are released at the surface of the tool when it is quenched. The small gas pockets thus formed can prevent contact between the tool and water, and the resultant ineffective quench causes soft spots. These soft spots are likely points for cracks to occur in the tool.

A good way to avoid this trouble is to quench in water which has been boiled to remove the dissolved gases. Suppose the water cannot be boiled? Then expel the gases by quenching a large amount of hot "dummy" material. Even better would be a 10 pct brine solution, made up using degassed water.

New Booklet on Bearcat Tool Steel

We recently issued an attractive 2-color booklet on Bearcat Tool Steel—the versatile general-purpose steel that is so well suited for applications involving high shock-resistance. The 8-page illustrated booklet contains a wealth of information about Bearcat—goes into considerable detail about its hot-work and easy-machining properties.

Bearcat is a super steel in every respect. It is air-hardening, thus minimizing quenching hazards, and it has good resistance to distortion during heat-treatment.

OTHER ADVANTAGES OF BEARCAT

In addition to superior shock-resistance, Bearcat has these other important advantages:

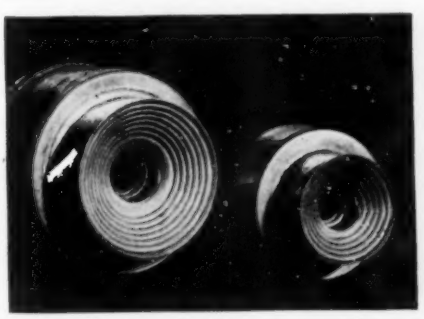
1. Deep hardening
2. Easy machining (Brinell 197 max)
3. Low distortion in heat-treatment
4. Good hot-work properties
5. Easily carburized for long wear

TYPICAL ANALYSIS

C	Mn	Si	Cr	Mo
.50	.70	.25	3.25	1.40

Bearcat is especially recommended for both hot- and cold-shock applications such as rivet sets, chisels, punches, hot headers, and gripper dies. It is also ideal for short-run dies used in cold-forming, blanking, and bending, as well as for engraving dies, die-casting dies, and master hobs. It has many other uses, too.

It will be worth your while to look into Bearcat. Why not talk it over with your Bethlehem tool steel distributor? And of course you'll want to read the new booklet on Bearcat. Write to the Publications Dept., Bethlehem Steel Company, Bethlehem, Pa. Ask for Booklet 341.



Here's a typical use for Bearcat—general-purpose dies requiring a high degree of toughness. These dies are used to produce aluminum impact-extrusions.

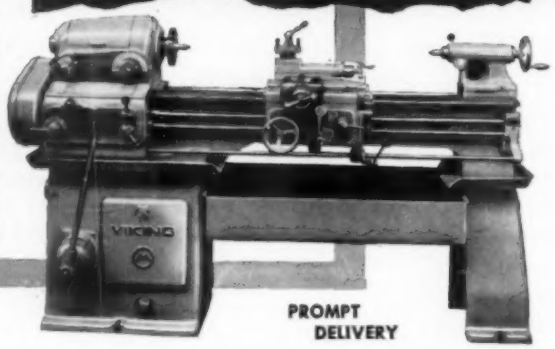
GET LONGER LIFE
with exclusive Colonial #3 steel drill jig bushings
Ask for handy "Flip-a-page" Catalog (B-649) and prices
COLONIAL BUSHINGS, Inc.
31780 Groesbeck Highway • Fraser, Michigan

COLONIAL
DRILL JIG BUSHINGS

USE READER SERVICE CARD; INDICATE A-12 182-1

INFINITE SPEED CONTROL WITHIN RANGE

VIKING 13¾" ENGINE LATHE



PROMPT DELIVERY

A patented variable speed unit enables the operator to select any required speed from 35 to 1200 RPM by the movement of a single lever. The headstock is designed with anti-friction bearings and is of rigid construction with hardened and ground spindle. All gears and spline shafts are hardened to insure long life. Measurements are in INCHES AND DECIMALS.

PARTIAL SPECIFICATIONS

Distance between centers	30", 40", 60"
Swing over bed	13¾"
Spindle speeds (RPM)	35-1200
Motor	3 HP

Write us now for complete details.

MOREY — for machine tools!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

USE READER SERVICE CARD; INDICATE A-12-182-2

HOW ABOUT SOUND FILMS FOR YOUR NEXT MEETING?

Available without cost — for your Group Programs, Training Schools, or Production Clinics!

Here's your chance to show action-packed close-ups of real, cost-cutting production operations — such as trimming, assembling, forming, marking, crimping, staking, broaching, drawing, and pressing; also one of the *fastest hydraulic press operations* you've ever seen. These 10, 20, and 30-minute films will highlight any program with revealing, worthwhile, entertaining information! There's *no* obligation!

Projection equipment furnished if you haven't your own facilities.

WRITE FOR DETAILS

The DENISON Engineering Co. 1191A Dublin Rd., Columbus 16, Ohio

USE READER SERVICE CARD; INDICATE A-12-182-3

Fellows

MACHINES and TOOLS
FOR CUTTING
. . . SHAVING
. . . BURNISHING
AND INSPECTION
in GEAR PRODUCTION

FELLOWS

THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

USE READER SERVICE CARD; INDICATE A-12-182-4

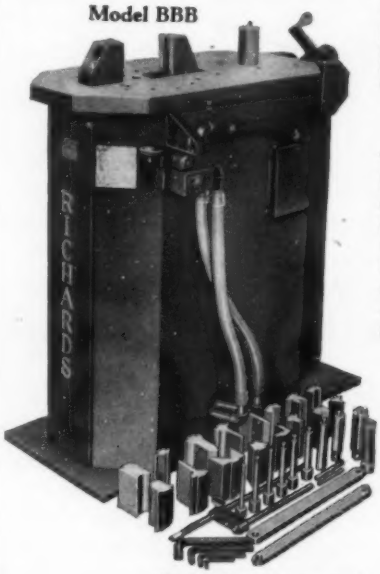
Multiform

BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

Model BBB

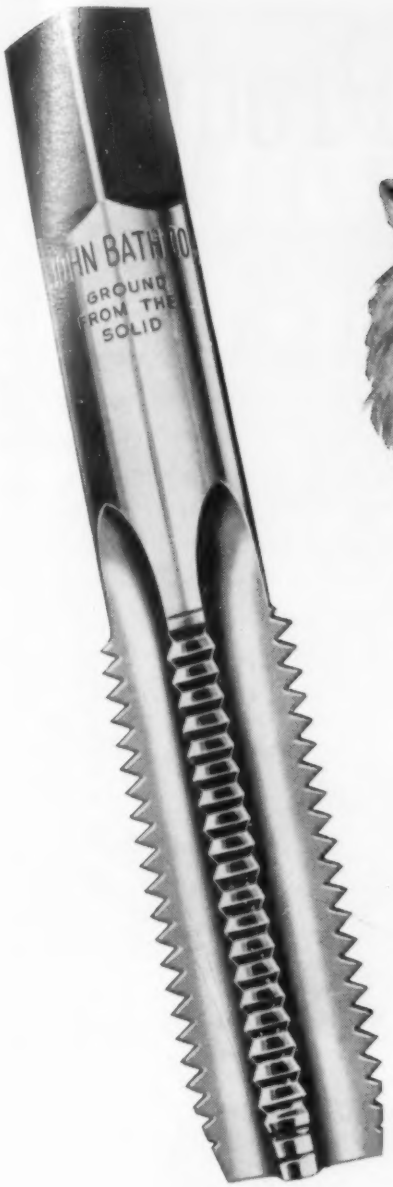


The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅛"x1½" material.

Send for illustrated folder TE-5

J. A. RICHARDS CO. 903 North Pitcher St. Kalamazoo, Michigan

USE READER SERVICE CARD; INDICATE A-12-182-5



Sharp

Bath Taps have teeth with sharp cutting edges too — capable of "putting the bite" on the toughest materials.

What's behind this sharpness?

In the first place, Bath Taps are designed right, to have the proper thread form, lead and angle for efficient cutting.

Then, there's the careful selection of steel . . . hardening in the solid . . . accurate spacing in thread grinding . . . quality control of all mechanical operations . . . plastic skin protection in final shipment — all these details are reflected in the sharpness of the finished tap.

Such high standards of procedure, assure sharp, refined cutting edges on Bath Taps, all the way to the crests of the teeth — to produce more threaded holes per dollar—longer tap life between sharpenings.

Your nearest Bath representative will be glad to relieve your "threadaches" — he's a specialist in his field.

Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.

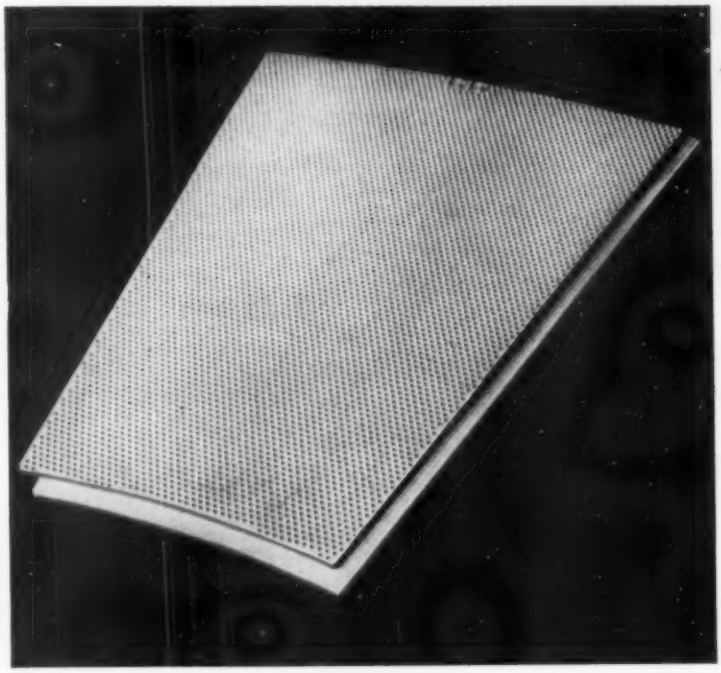
22 Grafton St., Worcester, Mass.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

Now They Are Mass Produced

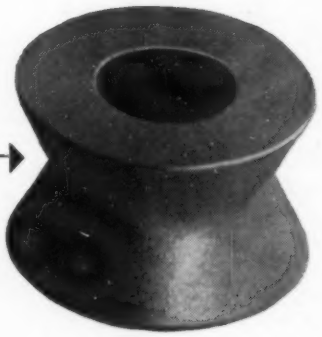
by HAYNES Investment Casting

Trade-Mark



IMPROVED DESIGN AND MATERIAL—The tiny needle-sharp points covering this plate must resist severe abrasion. Machined points used to wear out frequently because they were pyramidal in shape and highly susceptible to erosion. HAYNES investment casting made it possible to cast the points in a more stable conical shape from a hard, wear-resistant alloy. Life has been increased by 5 to 12 times.

EXCELLENT SURFACE QUALITY—For sanitary reasons, not even the smallest crevice can be tolerated on this cream separator part. Because of the high quality of HAYNES investment castings, it was found that the intricate part could be manufactured on a production basis with a minimum of imperfections showing up during the final polishing operations. This eliminated a great deal of wasted time, work, and metal.



NO MORE MACHINING—HAYNES investment casting eliminated the job of machining these rollers. Service conditions require that the rollers be made of a special alloy which is difficult to machine. They must resist rusting and the cutting action of wire passing over them under tension. The rollers give excellent service life and there are no more machining problems.

HAYNES investment castings can solve some of your own production and design problems. For more information, contact the nearest Haynes Stellite Company office listed below.

"Haynes" is a registered trade-mark of Union Carbide and Carbon Corporation.

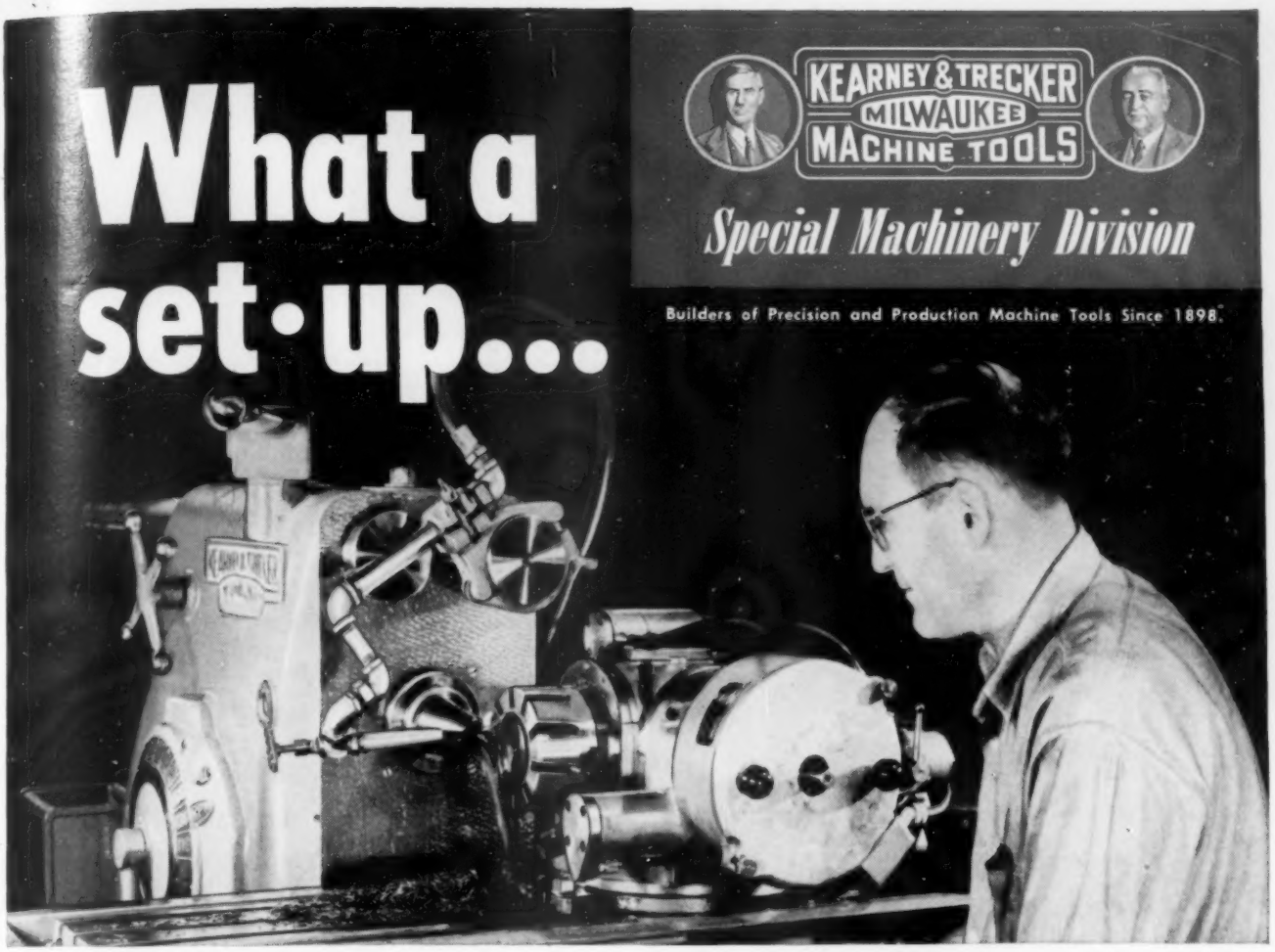
HAYNES INVESTMENT CASTINGS

Trade-Mark

Sound, dense, high-strength parts available in cobalt-base alloys, nickel-base alloys, iron-base alloys, stainless steels, and alloy and carbon steels.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

What a set-up...



KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

Builders of Precision and Production Machine Tools Since 1898

for the customer...it put a one-at-a-time indexing job on a production basis!

for the operator...only one motion controls entire indexing and milling operation!

THIS Universal Automatic Indexing Attachment, used in conjunction with the automatic cycle table movement on a Kearney & Trecker milling machine, eliminated a tedious dividing head job. A large midwest machine tool builder found this setup ideal for milling slots in face-milling cutter bodies.

CYCLE TIME CONSIDERABLY REDUCED . . . after each cut the table automatically retracts just enough to clear the cutter . . . attachment indexes automatically and next cut begins.

NOTCH PLATES CONTROL ACTUAL INDEXING . . . up to 24 divisions possible . . . plates changed in a matter of seconds . . . can be indexed two ways, automatically and manually.

ANY PRACTICAL ANGLE OBTAINABLE . . . work-holding spindle housing can be swung 15° below horizontal and 15° beyond vertical (total 120° tilt). It swivels 140° about its vertical axis.

Request additional information on this versatile attachment.

Capacity . . . Experience . . . Performance

Upon completion of this $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.

For complete details on this attachment . . . ask for *Data Sheet No. 1008*. Free booklet describing the facilities of the Special Machinery Division is also yours for the asking. WRITE TODAY TO SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 W. NATIONAL AVE., MILWAUKEE 14, WISCONSIN.

KEARNEY & TRECKER CORP. · *Special Machinery Division*

MILWAUKEE 14, WIS., U. S. A.

Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

for increased production

latest surface broaching methods on cast iron parts, teeth serrations and slots..

Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

Continuous Type Broaching Machine. Made in 4 Sizes.

● Whether the material is steel or cast iron, parts are being successfully surface broached on Footburt machines. Broaches used on Footburt Surface Broaching Machines have a patented tooth that is especially advantageous on heavy cuts. We will be glad to work with you on your machining problems and make recommendations based on our many years experience in surface broaching.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio

Detroit Office: General Motors Building

FOOTBURT

SURFACE BROACHING

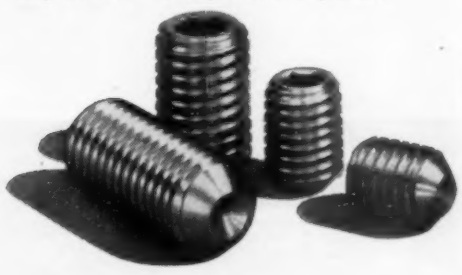
AIRCRAFT

NEW *Allenpoint* Set Screws

WITH SCIENTIFICALLY-DESIGNED SMALLER CUP POINTS

Tested comparatively by United States Testing Company* with standard cup point screws and screws with angled and serrated points, the new Allenpoint demonstrated (1) greater locking power at *all* measured installation vs removal torque pressures, (2) uniformly high shaft holding power in torque resistance tests, (3) unmatched performance under vibration, and (4) more complete shaft contact pattern. Sold *only* by leading Industrial Distributors. Write us for more facts about the results of these important tests of set screw performance.

**Report No. E 5576, March 17, 1953.*



ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

ALLEN HEAD

AIRCRAFT
PARTS . . . PRECISION TOOLED
by FULLER

Close tolerance parts for aircraft, radar, electronics, precision instruments, etc. Screw machine, milling, boring, grinding, honing, and lapping operations, with accuracies to .00005. Fine finishes to No. 3 Micro. Heat resistant and stainless steel, Nitralloy, bronze, etc.

FULLER TOOL CO.
4000 W. ELEVEN MILE RD.
BERKLEY, MICH. LINCOLN 5-7777

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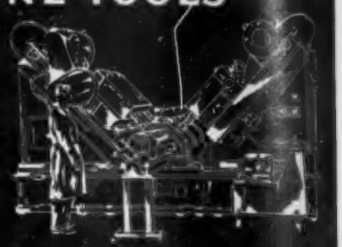
SINCE 1901
MOLINE "Hole-Hog"
SPECIALLY DESIGNED
MACHINE TOOLS

have cut production costs for American Industry.

DRILLING • BORING
HONING • TAPPING
and Special Machines

MOLINE TOOL CO.
"HOLE-HOG"
MOLINE, ILLINOIS



Boring V-8 Engine Cylinders

USE READER SERVICE CARD; INDICATE A-12 188-3

MICRO COLLINS FLAT
BLACK GRANITE SURFACE PLATES

Present an absolute continuous bearing surface, finished up to 50 millionths inch. Incredibly smooth. Falling objects do not cause humps. Being harder than hardened steel, can take greatest mistreatment without causing inaccuracy of surface. No oiling. Will not rust or warp. No re-scraping or frequent refinishing. Can use for spotting and "blueing in."

Immediate delivery in most sizes from 9x12 to 48x144. Request Bulletin and name of Distributor nearest you.

COLLINS MICROFLAT CO.
2326 E. 8th Street Los Angeles 21, Calif.

USE READER SERVICE CARD; INDICATE A-12-188-4

RING PUNCHES

•

HARD . . .
tough . . .
concentric . . .

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

Button Dies
Ring Type or Press Fit

Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.

Write TODAY for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

Exclusive distributor wanted for the states of Washington and Texas.

Ring Punch & Die Co.
108 FOOTE AVE., JAMESTOWN, N. Y.

USE READER SERVICE CARD; INDICATE A-12-188-2

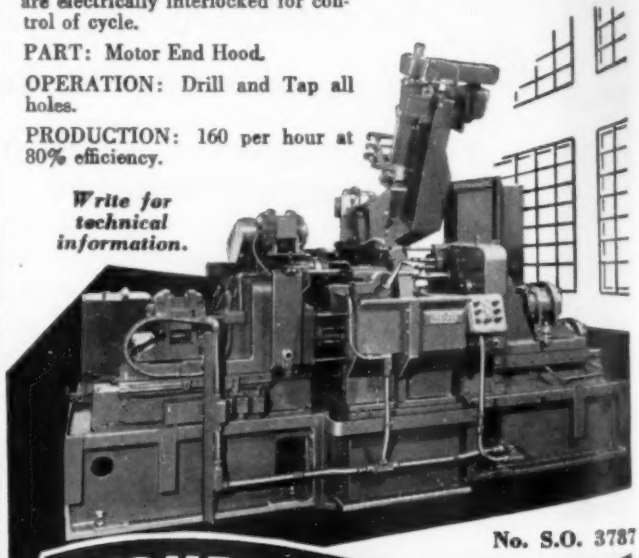
No. S.O. 3787: 4-Way Hydraulic Drilling and Tapping Machine equipped with two 10-H.P. Way Type Drilling Units and two 2-H.P. Drill Units. On the left hand unit is a 14-Spindle Drilling and Tapping Head and on the right hand unit an 11-Spindle Drilling Head. Between the heads is a 4-Station Trunnion Type Index Fixture with Hydraulic actuation. All units of the machine are electrically interlocked for control of cycle.

PART: Motor End Hood.

OPERATION: Drill and Tap all holes.

PRODUCTION: 160 per hour at 80% efficiency.

Write for technical information.



No. S.O. 3787

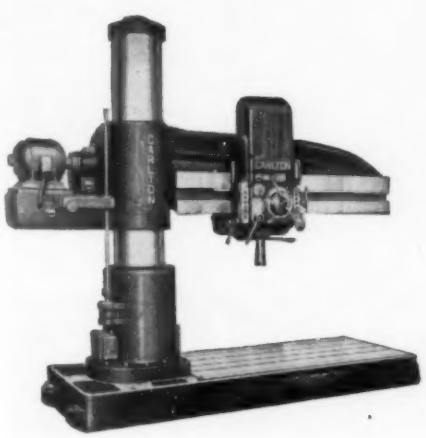
STANDARD MACHINE AND TOOL CO., LTD.
WINDSOR, ONT.

U.S.A. Sales Representative
ARNOLD J. WERNER CO.
New Center Bldg.
Detroit 12, Michigan

USE READER SERVICE CARD; INDICATE A-12-188-5

Only ONE can be called the Finest: Carlton

...here's another good reason why: low maintenance cost



CARLTON RADIAL DRILLS cost less to maintain because they are *designed for less maintenance attention.* For example: there's only *one* friction clutch to adjust. There are *no* tapered gibs to adjust because the head travels across the arm on hardened steel ways. Automatic lubrication throughout eliminates the damage and unnecessary wear that occurs in ordinary radial drills.

COMPARE CARLTON AND YOU'LL BUY CARLTON. Judge for yourself why Carlton radial drills are the first choice of American industry. Write for bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

HOW CRARLIMC® HOLLOW

PARKER • MAJESTIC PM PRECISION MACHINES

Pictured here is the home and products of

PARKER-MAJESTIC, INC.

For almost a quarter of a century this company has manufactured the **Parker** Spindles used in Precision Grinding, Boring and Milling applications. Additional products include the well known line of **Parker-Majestic** Internal, External, No. 2 Surface and Rotary Surface Grinders.

Descriptive literature upon request.

PARKER-MAJESTIC, INC.

formerly MAJESTIC TOOL & MFG. CO.

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

HOW GRAPH-MO® HOLLOW-BAR CUTS COSTS OF RING-SHAPED TOOL STEEL PARTS

1. MACHINES 30% FASTER

Free graphite in Graph-Mo's® structure cuts machining time 30% over other tool steels. It has a minimum tendency to pick up, scuff, seize or gall. It's also the most stable tool steel ever made. A typical Graph-Mo steel master plug showed less than 10 millionths of an inch dimensional change in 12 years!

2. ELIMINATES DRILLING

With Graph-Mo Hollow-Bar, drilling is eliminated because the center hole's already there. Finish boring is the first step. You save machining time. Available in sizes up to 16″ O.D. with a variety of wall thicknesses.

3. OUTWEARS OTHERS 3 TO 1

The combination of free graphite and diamond-hard carbides gives Graph-Mo unusual wear-resistance. Reports from users prove it outwears other tool steels an average of 3 to 1. And Graph-Mo responds uniformly to heat treatment.

4. MORE PARTS PER TON

You start closer to your finished product with Graph-Mo Hollow-Bar. You machine away a minimum of steel, cut scrap loss. Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and Peninsular Steel Co. warehouses. For more information about Graph-Mo Hollow-Bar, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO."

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

WAUKESHA SHORT SHANK INSERTED BLADE SPADE DRILL especially developed for large hole drilling with screw machines.
The WAUKESHA STUB HEAD SPADE DRILL may be used with holders made by yourself from tube stock to any length for extremely deep hole drilling. Thus you avoid paying a premium for a "special" tool.
Inserted Blade Reamers, Spade Drills, Floating Chucks and Tool Holders, Counterbores and many special tools are shown in WAUKESHA Catalogue. Complete with sizes and prices. Send for your copy today.
IT PAYS TO CHECK WITH WAUKESHA

YOU CAN SAVE costly boring in large hole drilling from the solid with WAUKESHA INSERTED BLADE SPADE DRILLS

Low in first cost, WAUKESHA Inserted Blade SPADE DRILLS solve the problem of taper wear on a solid drill. Since you use only the blade cutting edge of the WAUKESHA SPADE DRILL the blade maintains original O.D. grind after grind — through the entire life of the blade . . . And blade replacement costs little — the body lasts for years.

And you can save costly boring. Here's an example: A job called for drilling out a 3⅛" hole through 120 pieces of steel 10" long. Previously they used a 2" solid twist drill and then bored to size . . . BUT with a WAUKESHA 3⅛" SPADE DRILL they not only completed each piece in one operation but also ran a carbide turning tool simultaneously on the periphery.

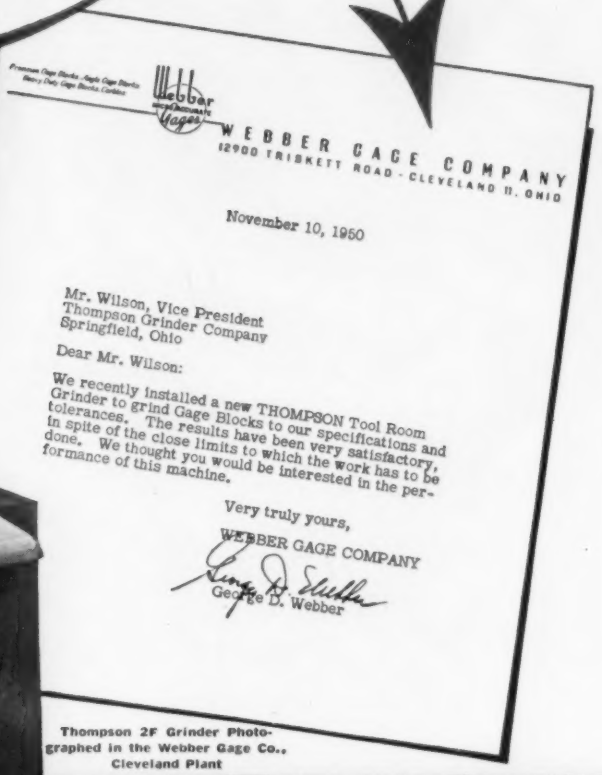
SAVINGS: The Spade Drill and 3 blades paid for — PLUS $260.00 on the first run of 120 pieces.

WAUKESHA TOOL CO.

WAUKESHA, WISCONSIN

Here's Proof

The New Thompson Type 2F is a SUPER PRECISION Tool Room Grinder



WEBBER GAGE COMPANY
12900 TRISKETT ROAD - CLEVELAND 11, OHIO

November 10, 1950

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

Handy control panel.

- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid tra verse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

Increases production 25%

NEW ROTOR TOOLS "PAID OFF" IN 13 WEEKS

JOB—Large truck cabs had to have heavy welds blended for good appearance. Men objected to heavy 14-pound grinders. Incentive shop . . . needed more production to meet schedule. Grinders required constant maintenance.

SOLUTION—Put Rotor B-12 Verticals at 6000 RPM on trial to determine their metal removing qualities.

RESULTS—Time studies show increase of 25% in production. Savings "paid off" the new tools in 13 weeks, reduced operator fatigue, cut maintenance and sanding disc costs.

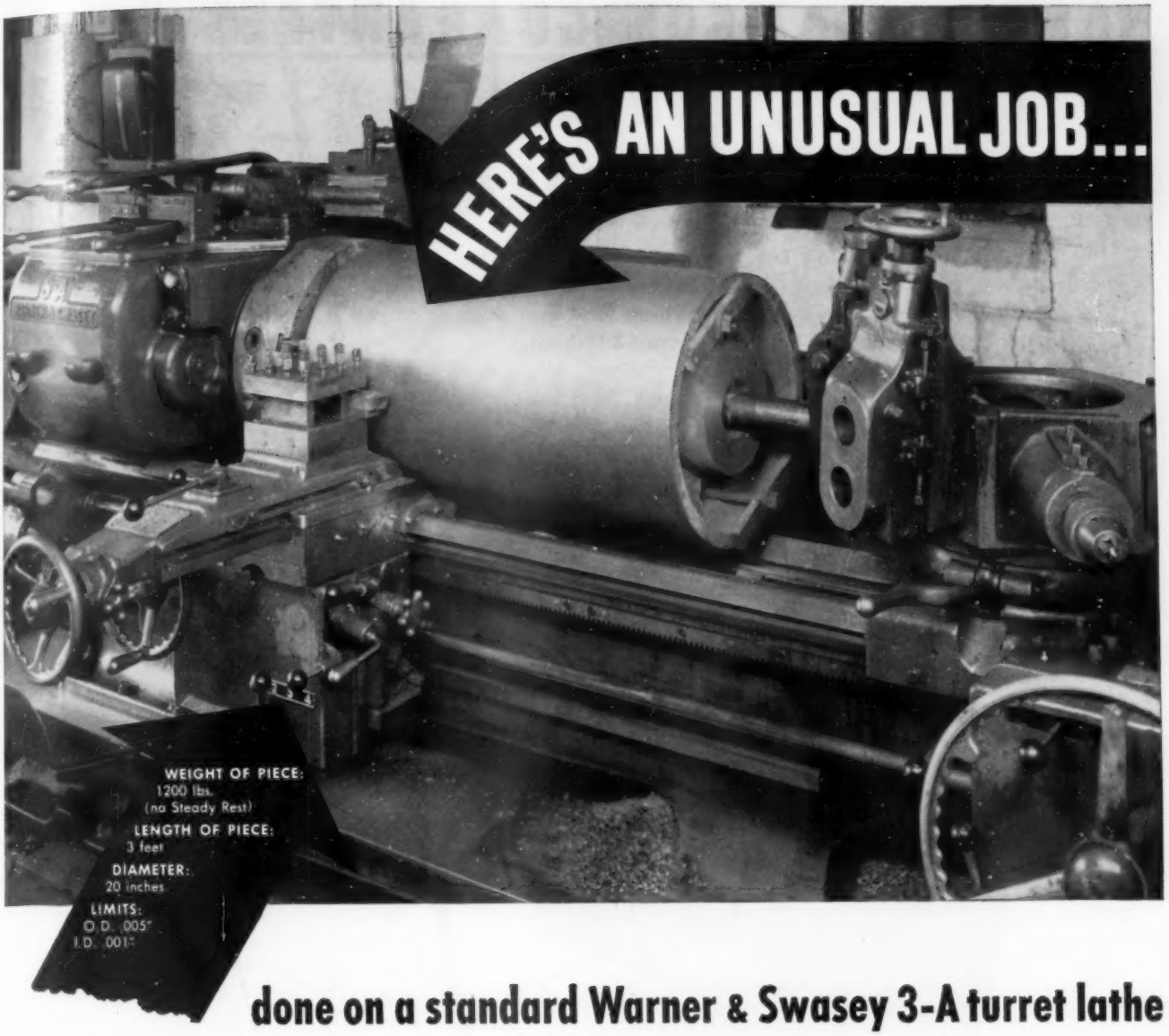
Ask for a demonstration of Rotor tools and figure the savings on *your* operations! Call for a trial. Catalog 40 describing the Rotor line of production boosters is yours for the asking.

ROTOR GRINDER FACTS

B-12 Vertical — **5" Cup Wheels**
7" Sanding Pads
10 lbs. — **7" Cut-Off Wheels**
4500-5000-6000 R.P.M.

High speed under load—adjustable handles for comfort—built to "take it" on tough jobs.

JONES & LAMSON GUARANTEES



done on a standard Warner & Swasey 3-A turret lathe

THE HALEY MACHINE COMPANY of Springfield, Ohio, contracts to produce massive coal-crusher rolls.

These dense cast iron rolls weigh 1200 pounds each. They are 36″ long and 20″ in diameter. The two hub bores, 6″ and 9″ long, must be finished to .001″, and the O.D. to .005″. All diameters must be held concentric within .005″.

The roll was gripped internally and machined *with no steady rest*—held securely by the 3-jaw scroll chuck and two light tie rods. Two chuckings were needed, one for each end.

All limits were held, with an excellent finish obtained. The surprisingly fine results have assured Haley production men that this job can be done profitably on a Warner & Swasey Turret Lathe.

The size and weight of this job, demanding smooth finish and unusually close limits, clearly shows the extreme rigidity and accuracy built into each Warner & Swasey Turret Lathe. Why not find out how this rigidity and accuracy can help you solve your turning problems? Call your nearest Warney & Swasey Field Representative or write...

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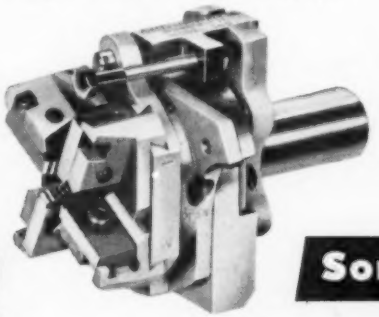
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J & L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.



FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

RADIAL CHASER TYPE
Capacities from #8 to 4¼"

TANGENT CHASER TYPES
Stationary and Revolving. Capacities from #4 to 2"

Some of the reasons why:

COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS. J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING. This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

EASY, CONTROLLED RESHARPENING. J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.

P.S. *Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.*

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Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 518 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L DIE HEAD DIVISION

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Microbore

...the multipurpose single point adjustable tool for precision boring, turning and facing operations.

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The Multipurpose single point adjustable tool
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FOR PRECISION BORING, TURNING AND FACING OPERATIONS

For General Purpose Work:

A wide range of standard Microbore boring bar sets is available for tool work and general purpose boring.

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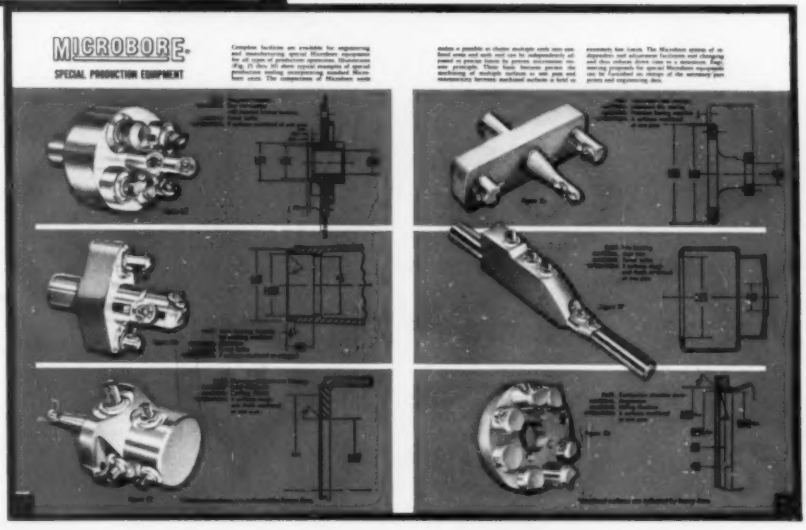
A complete service is available for engineering and manufacturing special Microbore equipment for all types of production operations.



A request on your company letterhead will bring a free copy of this catalog.

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2 MILNE WAYS TO CUT YOUR TOOL STEEL COSTS

1

MILNE'S KOLORKOTE IDENTIFICATION

With Matching Heat Treat Card

Permanent, quick-as-a-glance identification of Milne tool steels is a sure thing because they are spray painted an identifying color over their entire length. With every shipment goes a heat treatment card of a color that matches the steel. You eliminate costly errors, delays, confusion and 'phone calls. Inventory control, scrap identification and stock movements are simplified.

You know *what you get...how to treat it... as long as you have it.*

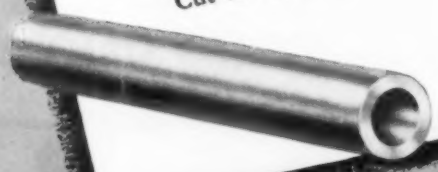
2

MILNE'S HOLLOW DIE STEELS

You get more tool per pound when you use Milne hollow steels.

Waste is minimized. Smooth finish inside and out saves hours of machining. Each piece is uniformly annealed *at the mill*. Prompt deliveries from stock. Eliminates waiting for forgings.

Cut to any length desired.



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New Pre-Shaped Steels

These are special cold drawn sections that start where machining often leaves off... make many machining operations obsolete.

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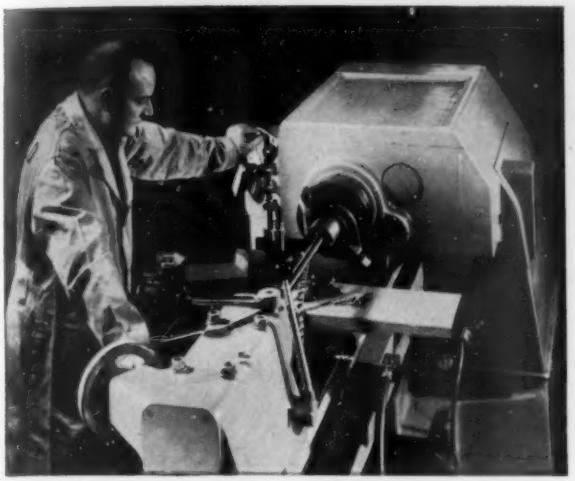

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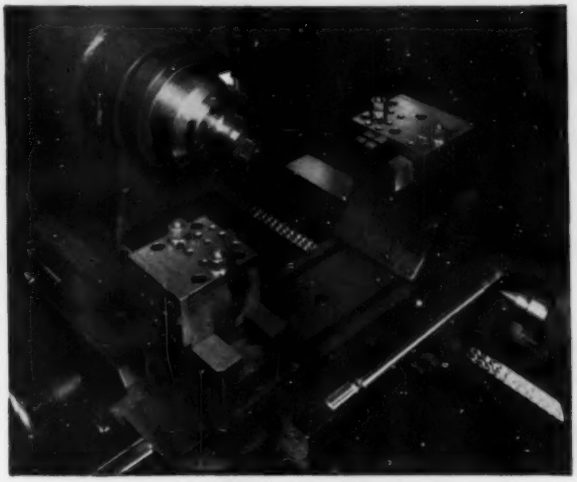

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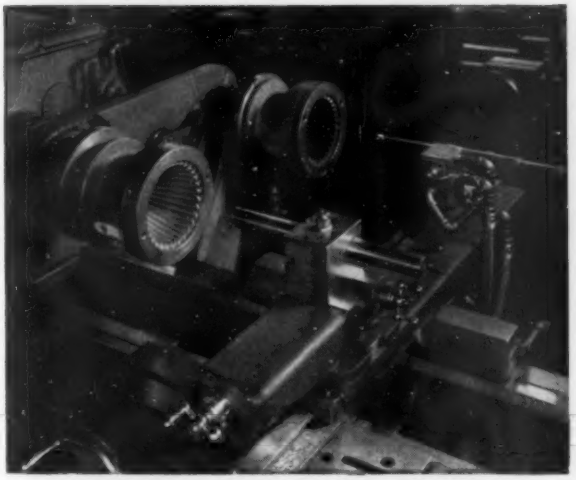

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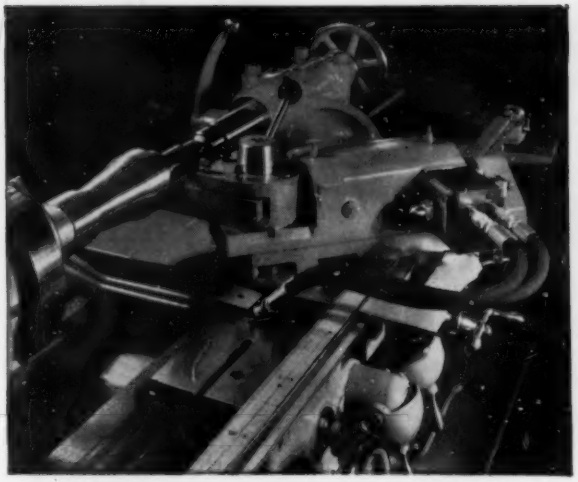

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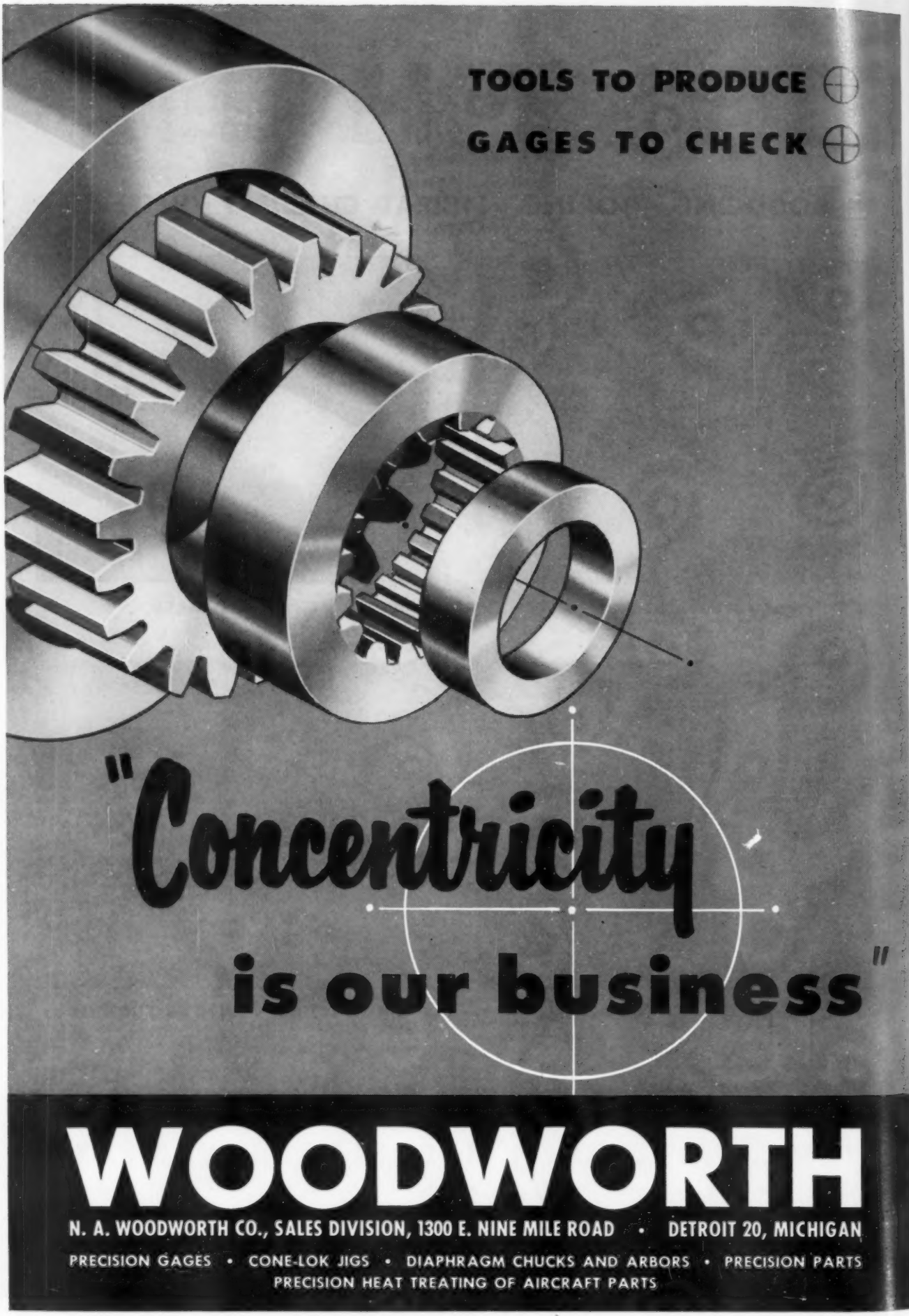
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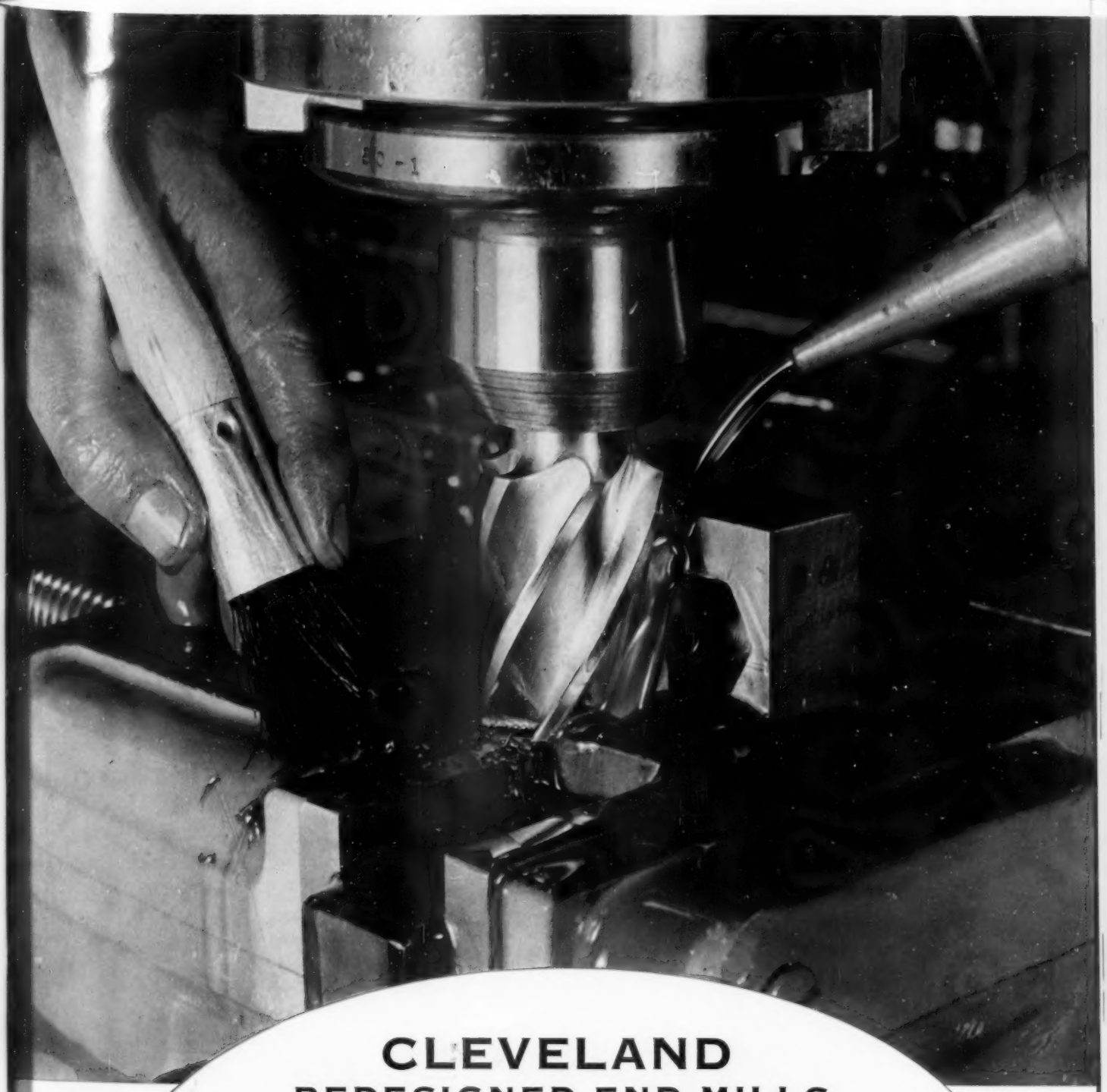

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In a complete range of tungsten, moly, cobalt, and high vanadium types

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SUPER PANTHER
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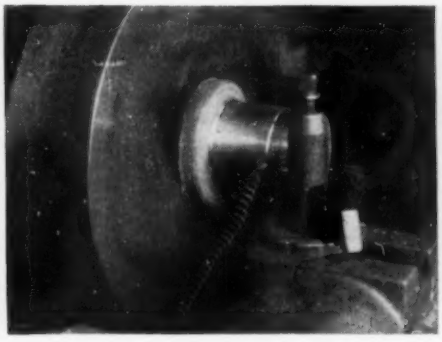
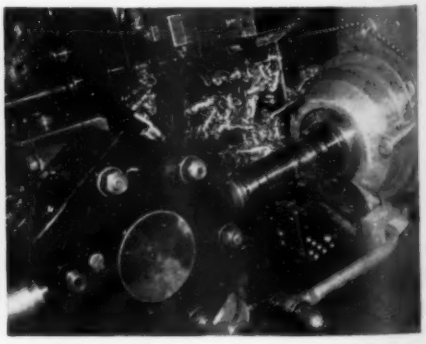
Cut to length . . . bevelled both ends . . . heat-treated to perfection. Just shape the point and you're all ready to go . . . A-L Tool Bits are the last word in convenience.

Made in a complete range of tungsten and moly high speed steels . . . including the new cobalt and high vanadium types that offer superior red hardness, wear-resisting and cutting properties.

Furnished in Standard finish or the popular Ground finish which is extremely accurate in dimension and free from decarburization and scale.

For real Johnny-on-the-spot service on the finest tool bits obtainable, call your local A-L office or distributor . . . TODAY! • *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*





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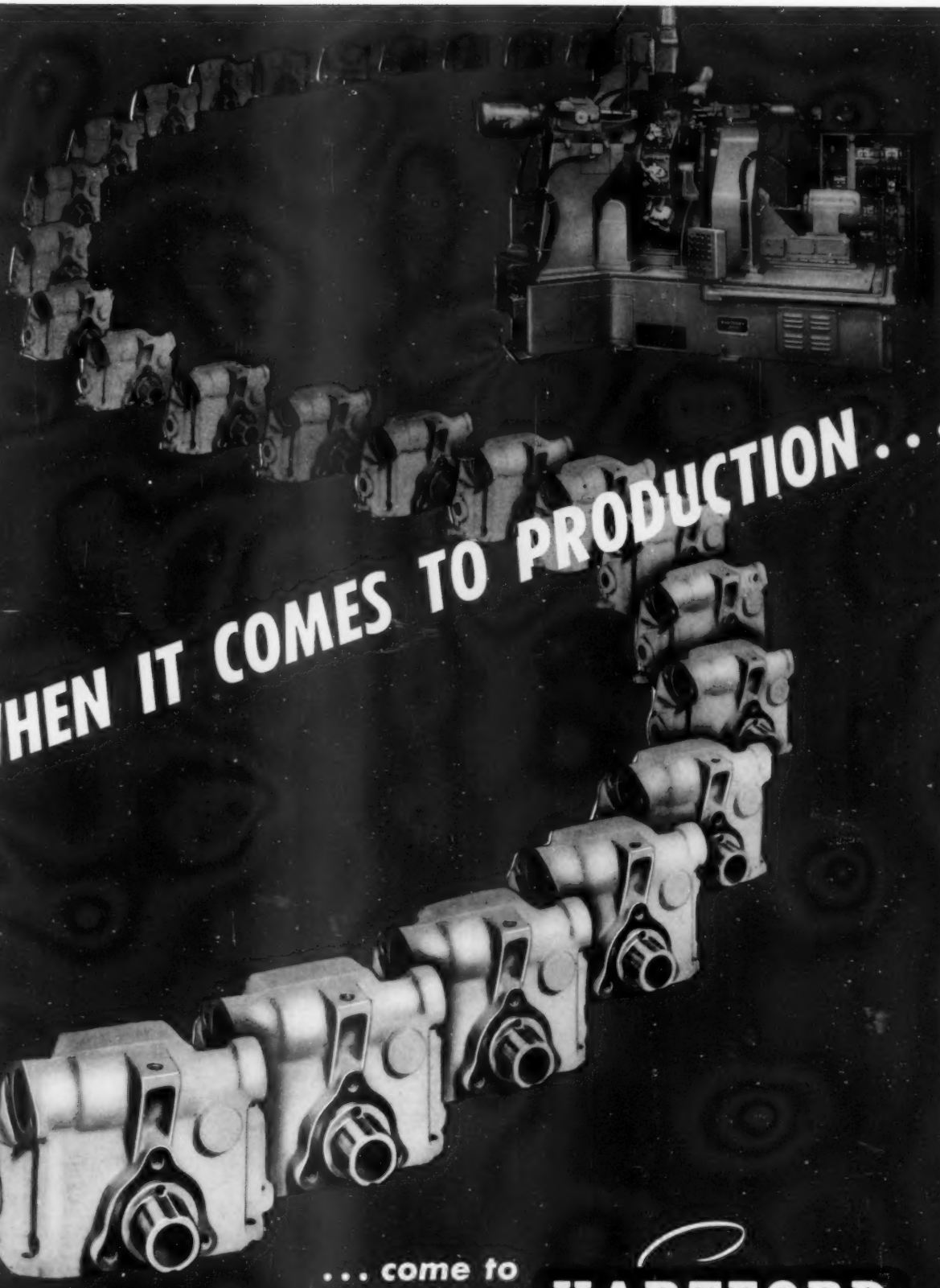

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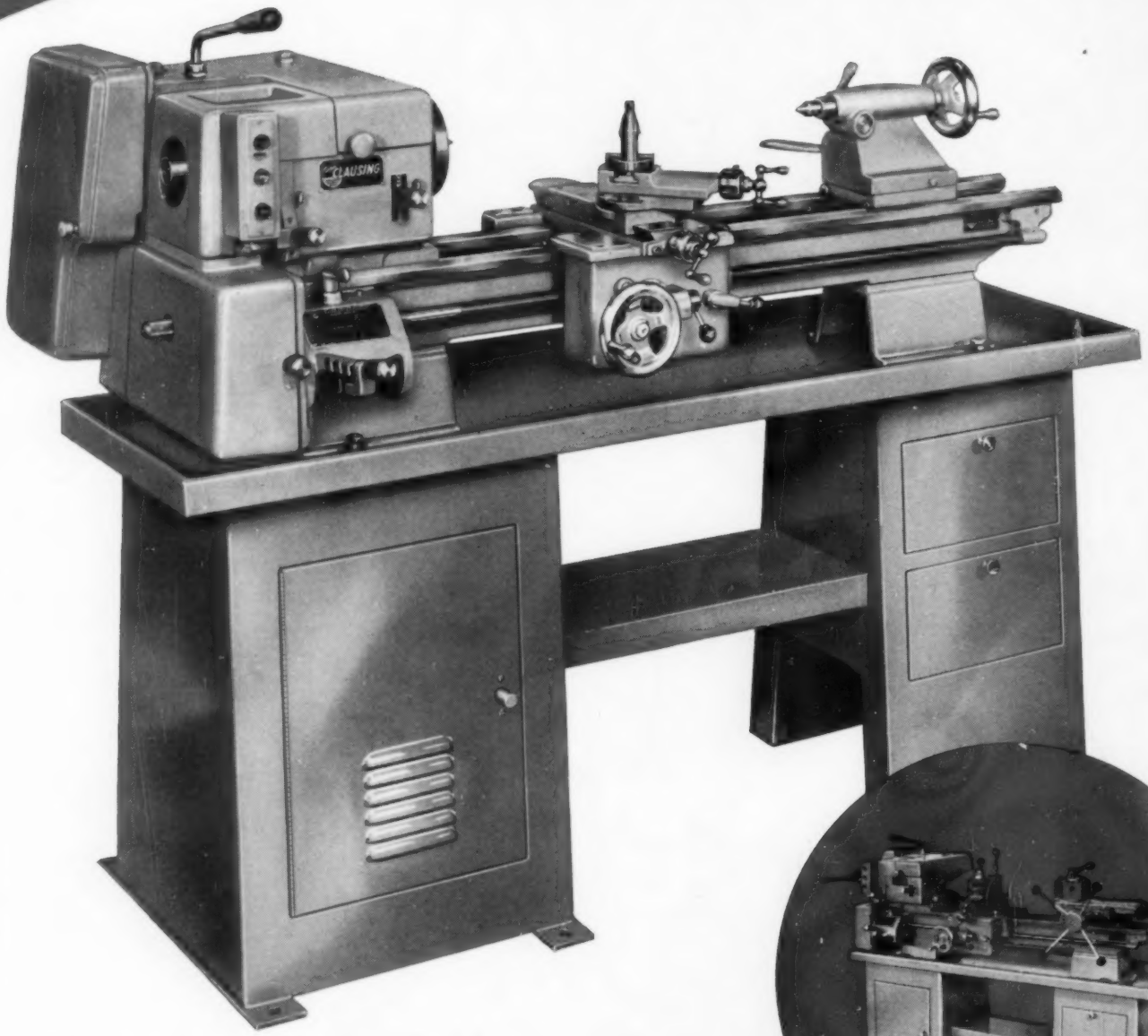

No. 5300 Clausing lathe equipped with lever type collet chuck, lever type carriage turret, bed turret for production hand turret operations.

5300 SERIES CONDENSED SPECIFICATIONS

CAPACITY	Swing: 12¾" over bed; 12½" over saddle wings; 8½" over saddle. 24"-36"-48" between centers.
THREAD RANGE	48 selections. 4 to 224 Standard, right or left.
SPINDLE SPEEDS	Direct: 173, 272, 454, 492, 780, 1300 RPM. Backgeared: 29, 46, 77, 83, 132, 220 RPM.
SPINDLE	Nose, 2¼" - 8 threads. Bored for No. 4½ MT, with reducing sleeve to take No. 3 MT 1⅜" hole thru spindle. 1" collet capacity.
COUNTERSHAFT DRIVE	Built-in, with clutch and brake. ⅝" wide B-belts. 3-step spindle pulley, 2-step motor pulley.

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PLUS in lathe history!

12" CLAUSING "5300" SERIES (1" COLLET CAPACITY)

"ZERO-PRECISION" TIMKEN TAPERED ROLLER BEARINGS, AND EXCLUSIVE FRICTION CLUTCH AND BRAKE COUNTERSHAFT = GREATER ACCURACY . . . TOP PRODUCTION

For production capacity, accuracy and profit potential, the brilliant new CLAUSING 5300 gives you more *Plus Value* features than have ever before been available in a 1" collet capacity lathe . . . at or near its price!

CAPACITY PLUS! 12" swing + 1⅜" hole through 16" long spindle + 2¼"-8 thread spindle nose + 1" collet capacity + heavy duty No. 3 MT tailstock with tang socket + ⅞" diameter lead screw + 12 speeds, 29 to 1300 RPM + 9" cross slide travel + 2¾" tool post slide travel + up to 48" between centers = Bigger Tool and Job Capacity . . . Wider Work Range!

ACCURACY PLUS! New heavy-duty headstock and tailstock . . . massive bed and carriage . . . for maximum rigidity and stamina + headstock diamond bored for husky Timken "Zero-Precision" tapered roller bearings, the most accurate used in any lathe + forged steel, precision ground spindle with hardened nose + headstock, carriage and tailstock hand fitted to precision ground Vee and flat ways of bed = Greater precision . . . Closer tolerances!

ECONOMY PLUS! Built-in countershaft with friction clutch and brake permits instant starts and stops of spindle without stopping motor + oil flinger spindle bearing lubrication + long wearing steel cable B-section V-belt drive + automatic apron with splash lubrication + instant selection of 48 threads or feeds = Savings in Time . . . Increased Production . . . Longer Life!

New Pedestal Base and Pedestal Cabinets! New pedestal bases and pedestal cabinets are 3/16" steel plate, welded and braced with thick box-type channeling . . . rigid foundations for accurate lathe work. Cabinet, illustrated at left, has drawers in tailstock pedestal . . . base has plain tailstock pedestal. Both have shelf between. Be sure to see the new Clausing 5300 at your Atlas-Clausing dealer's. Feature by feature comparison will prove it's the Biggest PLUS Value in Lathe History!

BENCH LATHE, 24" CENTERS	$715.00	PEDESTAL BASE $160.00	PEDESTAL CABINET $200.00
BENCH LATHE, 36" CENTERS	745.00	PEDESTAL BASE 165.00	PEDESTAL CABINET 220.00
BENCH LATHE, 48" CENTERS	830.00	PEDESTAL BASE 175.00	PEDESTAL CABINET 240.00

Prices are less motor and are F.O.B. factory, Ottumwa, Iowa. Prices subject to change without notice.

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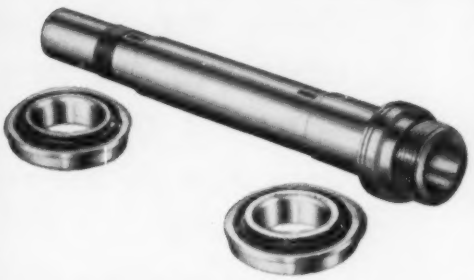
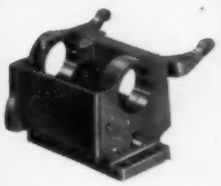
QUICK CHANGE MECHANISM Provides instant selection of 48 threads or feeds. ½" wide steel gears. Ground shafts turn on ball bearings. Plunger-type selector control.

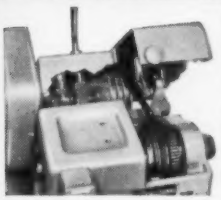
PRECISION GROUND BED Massive, semi-steel bed is 7⅜" wide, 5⅛" deep — thickly ribbed and braced. Vee-ways, flat ways and undersides are ground. Built-in screw-type leveling jacks.



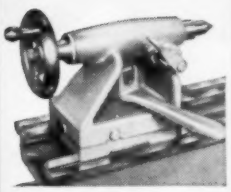
BIG PRECISION SPINDLE WITH "ZERO-PRECISION" BEARINGS. Precision ground, forged steel spindle turns on widely spaced heavy-duty Timken "Zero-Precision" tapered roller bearings — bearing run-out tolerance is .00015.



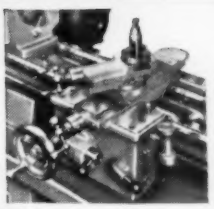
MASSIVE HEADSTOCK Massive headstock casting weighs 45 lbs. Heavy duty construction, plus malleable iron countershaft bracket anchored and doweled to casting to bridge drive opening, assure accurate alignment and rigidity for "the heart of the lathe."



CLUTCH AND BRAKE EQUIPPED COUNTERSHAFT Friction clutch-brake that permits instant starts and stops of spindle without stopping motor. Belts are fully guarded.



LARGE TAILSTOCK Heavy-duty tailstock has No. 3 MT ram with tang socket. Swing-type wrench, permanently attached, controls bed lock.



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AIR CIRCUIT DESIGN AND COST SIMPLIFIED BY AIR CYLINDER WITH BUILT-IN VALVE . . .

VALVE AND ALL OPERATING CONTROLS ARE INTEGRAL WITH THE CYLINDER. Only one air connection is required.

In pneumatic circuits the closer the valve to the cylinder, the faster, more economical and more efficient is the operation. The advantages of "close-coupling" are universally recognized by pneumatics engineers. But only Bellows offers the ultimate in "close-coupling" — an air cylinder and valve as one integral unit.

This unique Air Cylinder, with its built-in valve, is known the world over as the Bellows Air Motor. It has brought a new simplicity and effectiveness to pneumatics operation. It has created an entirely new conception of the use of air power in production processes.

In the decade since the first Bellows Air Motor was built almost 20,000 manufacturers have installed these compact power units. In many plants as many as a thousand Air Motors are in use; in many plants Bellows Air Motors operate 24 hours a day, month in, month out, building operating records of thirty, forty, even fifty million cycles.

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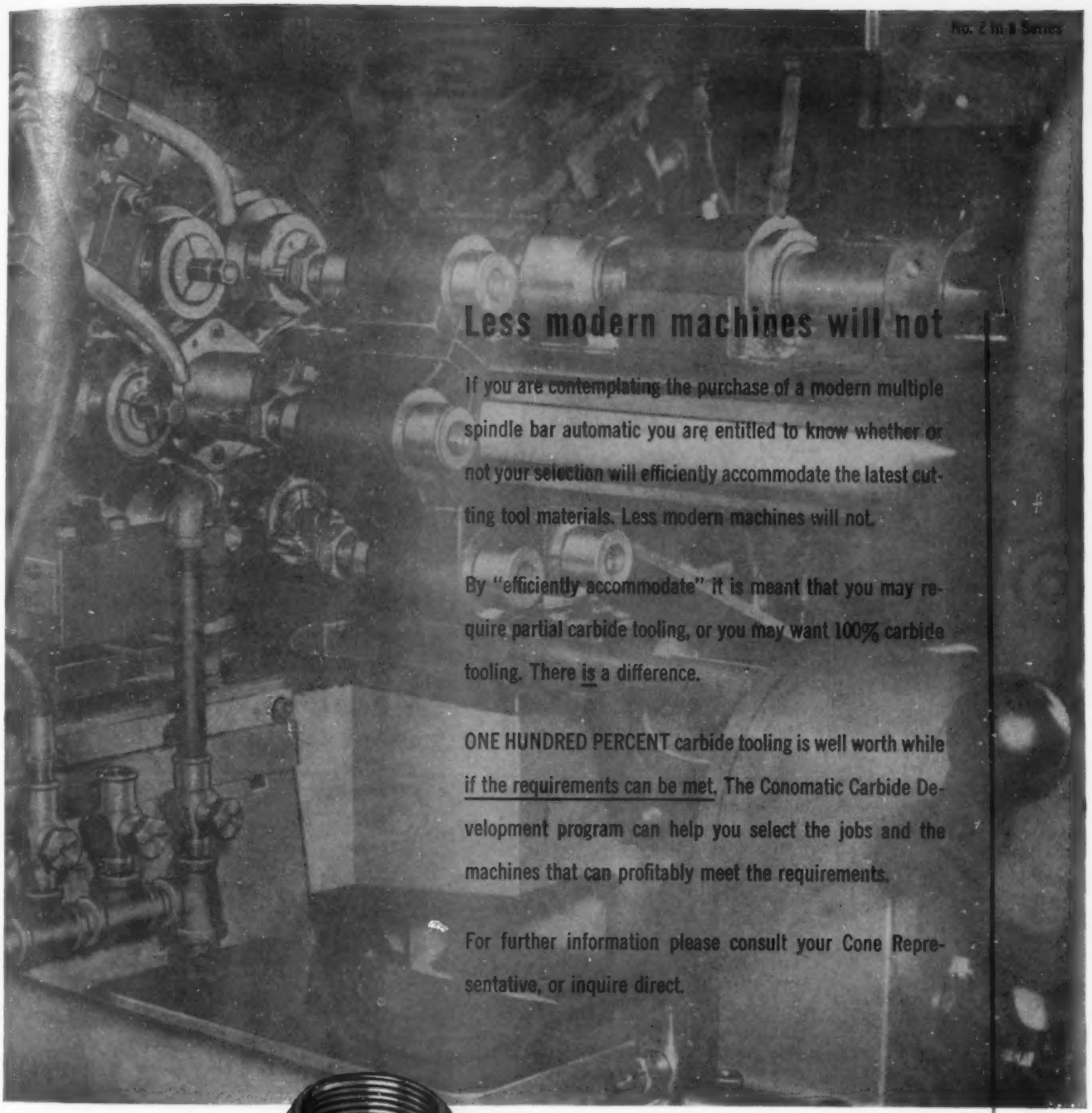

Less modern machines will not

If you are contemplating the purchase of a modern multiple spindle bar automatic you are entitled to know whether or not your selection will efficiently accommodate the latest cutting tool materials. Less modern machines will not.

By "efficiently accommodate" it is meant that you may require partial carbide tooling, or you may want 100% carbide tooling. There is a difference.

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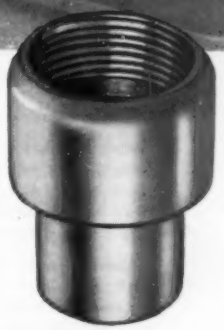
For further information please consult your Cone Representative, or inquire direct.



MATERIAL—1040 STEEL

	HSS	CARBIDE
Cycle Time	*	30 secs.
Work Spindle Speed	*	670 R.P.M. at 160 S.F.
Tool Wear	*	2000 pcs. per grind

*Hot rolled material prevents fair comparison

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

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Glenzer

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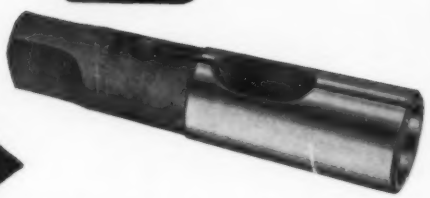
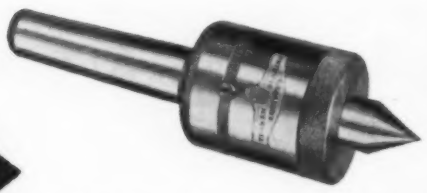


UTILITY SLEEVES

Use lower-cost, straight shank small tools with these Removable Taper Shank Sleeves. Data Folder 1-A.



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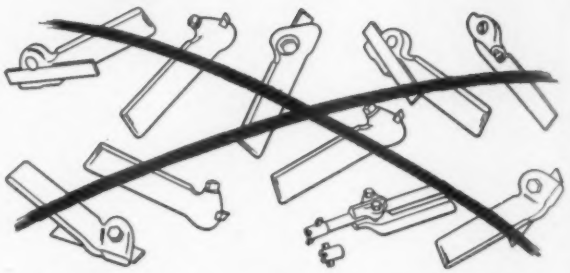
ONE ALL PURPOSE TOOL HOLDER INSTEAD OF TEN



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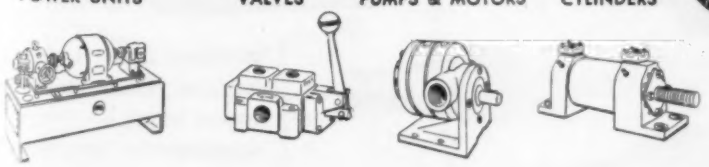

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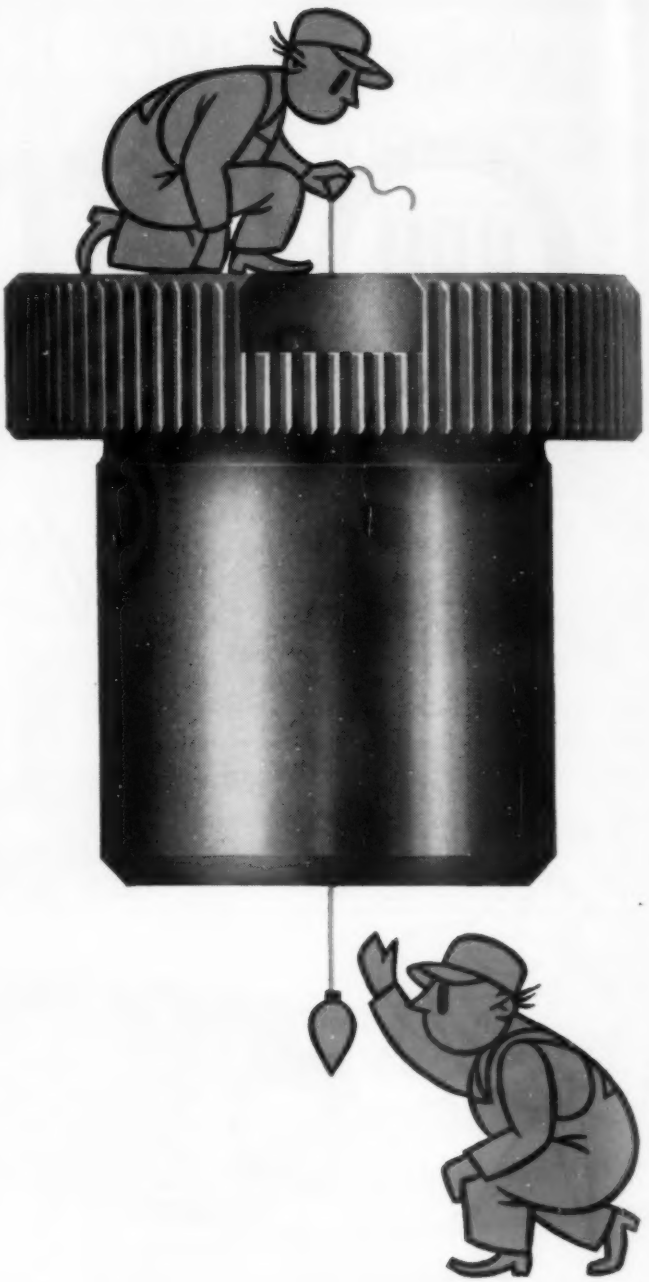

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1 STANDARD COLLET CHUCK
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One of these new materials may be the perfect answer for some metal-cleaning problem that's been giving you a lot of trouble. Just check the list of cleaning jobs, then circle the corresponding number in the coupon, and we'll be glad to tell you about the new chemical designed for your work.

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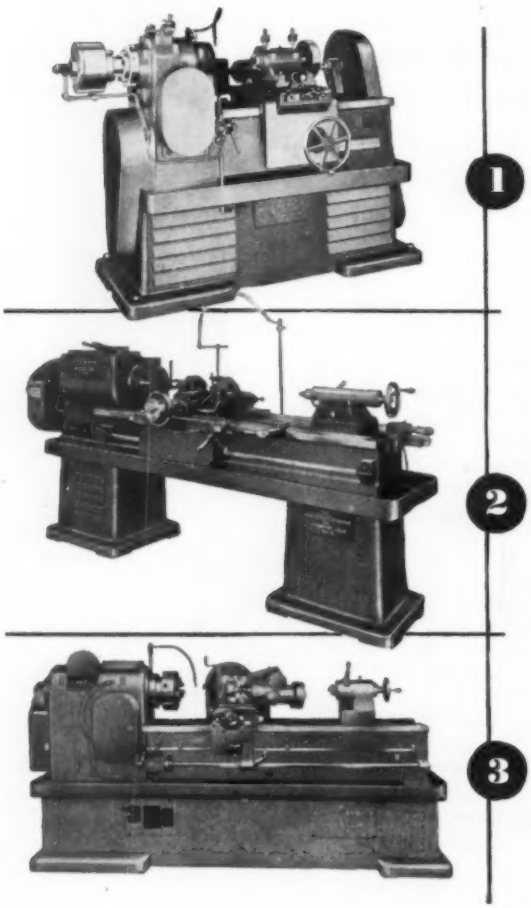

3 models for Varying Threading Operations:

1. **"H1" Hob Thread Milling Machine**
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3. **"Threadmaster" Thread Milling Machine**
   . . . for precision, long and short traversing, elevating, cross feed and lead screws . . . AUTOMATICALLY.

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Machine Tool Builders Since 1896

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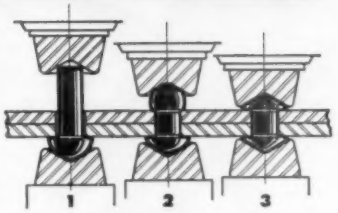
WHY HANNIFIN "HY-POWER" RIVETERS SAVE YOU MONEY

STRONGER JOINTS!



This "silent squeeze" method gives you (1) rapid advance to riveting position, (2) high-pressure shaping of the rivet, cold or hot, and (3) automatic reversal as soon as the rivet is formed. Why are these rivets stronger? Because with this method the rivet shank expands to completely fill the hole and, as the metal flows to shape the heads, fillets are formed under both heads. The rivet is work-hardened, too, and every rivet is uniform.

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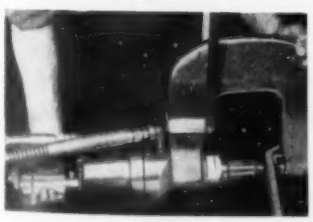

Yes! From the time the button is touched it takes only 2½ seconds to head a ⅜" rivet. *"Hy-Power" is safe, too!* For the stroke can be interrupted and the ram reversed automatically anywhere in the cycle, simply by releasing the control button.

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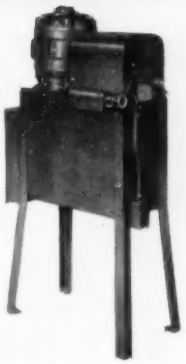

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...your "Hy-Power" cylinders—available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities (more in multiple). Cylinders can either be mounted in yokes (portable or stationary) or installed in machines of your design.

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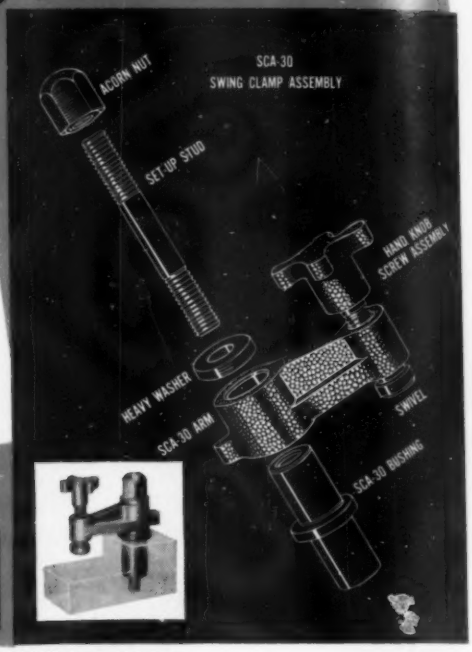

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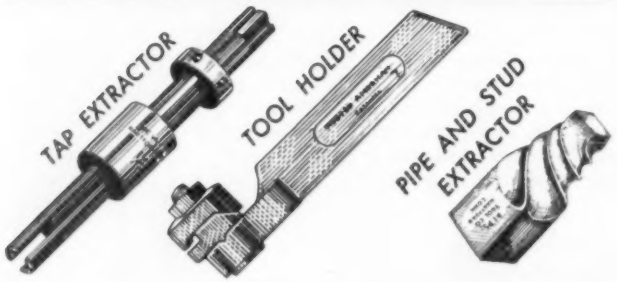

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SAVE LABOR
KEEP PRODUCTION MOVING

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*Patented.

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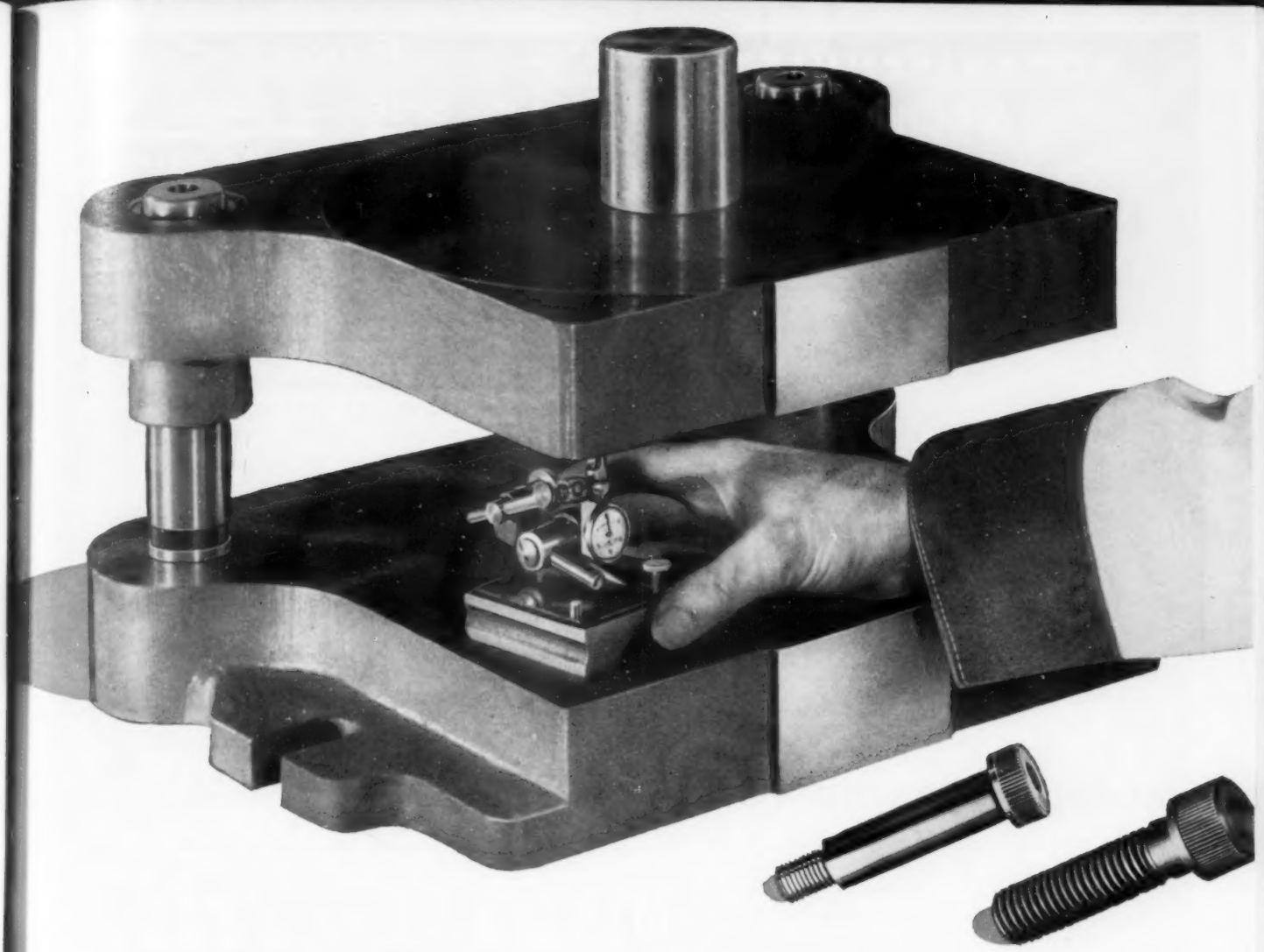

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BOYAR-SCHULTZ SCREW MACHINE TOOLS

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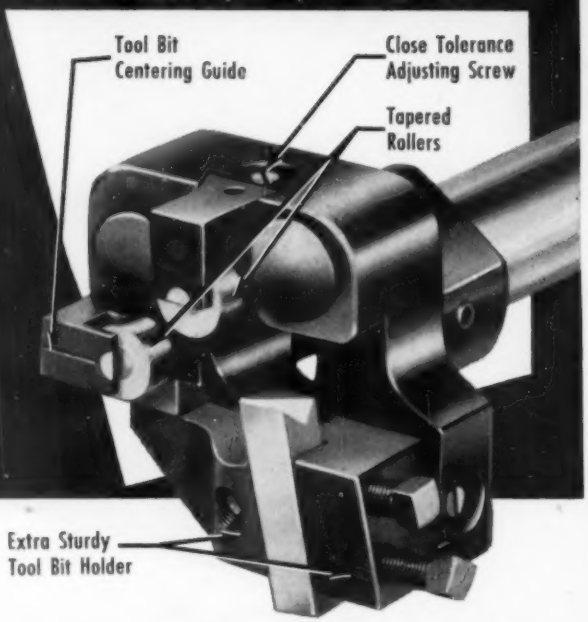

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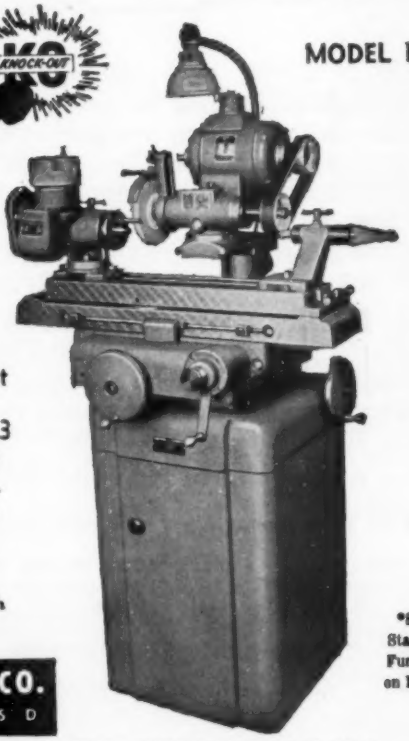
of all popularly-priced Tool and Cutter Grinders sold in 1952 were *"Knock-Outs"*

MODEL B860



Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

*Sales Statistics Furnished on Request

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ABERDEEN, S. D.

USE READER SERVICE CARD; INDICATE A-12-216-4

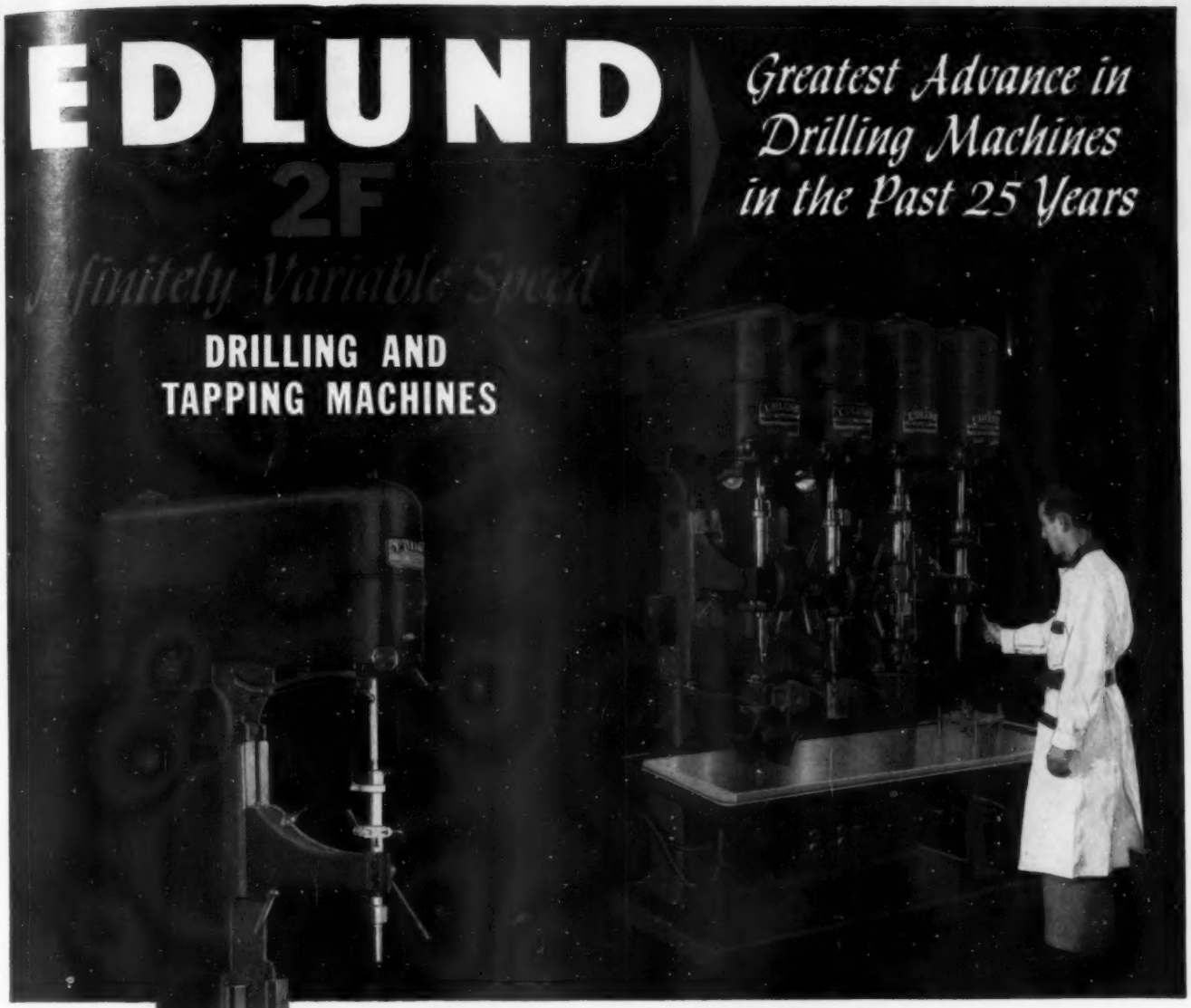
Automation

EDLUND 2F

Infinitely Variable Speed

DRILLING AND TAPPING MACHINES

Greatest Advance in Drilling Machines in the Past 25 Years



Variable Speed Model 2F Edlund drilling and tapping machines in standard models to meet your requirements
Spindles: 1, 2, 3, 4, 6, or 8
Speeds: From 50 to 3600 RPM
Overhang: 8" or 15"
Column: Pedestal or Round
Capacity: To 1¼"
Special models engineered to order.
Additional Edlund Equipment: Back Gears (ratio 4 to 1); Semi-Automatic Power Feed; Coolant System; Work Lights; Reversing Motor Tapper; Lead Screw Tapper.

INCREASED PRODUCTION
—25% or more

MAXIMUM TOOL LIFE
—Correct Speed

PRECISION PERFORMANCE
—Rigid Construction

The Edlund new Model 2F with infinitely variable speeds, gives your operator an infinite number of speeds within a broad range—not the ordinary three, four and eight speeds—this means **correct speed for maximum tool life and greatest production.**

Speed changes are made instantly without stopping and valuable production time is not lost changing belts or gears. Convenient controls for easier operation and rigid construction with ample work table area assure precision performance. Here is the advanced-design drilling and tapping machine built under actual tool room and production test conditions for your requirements.

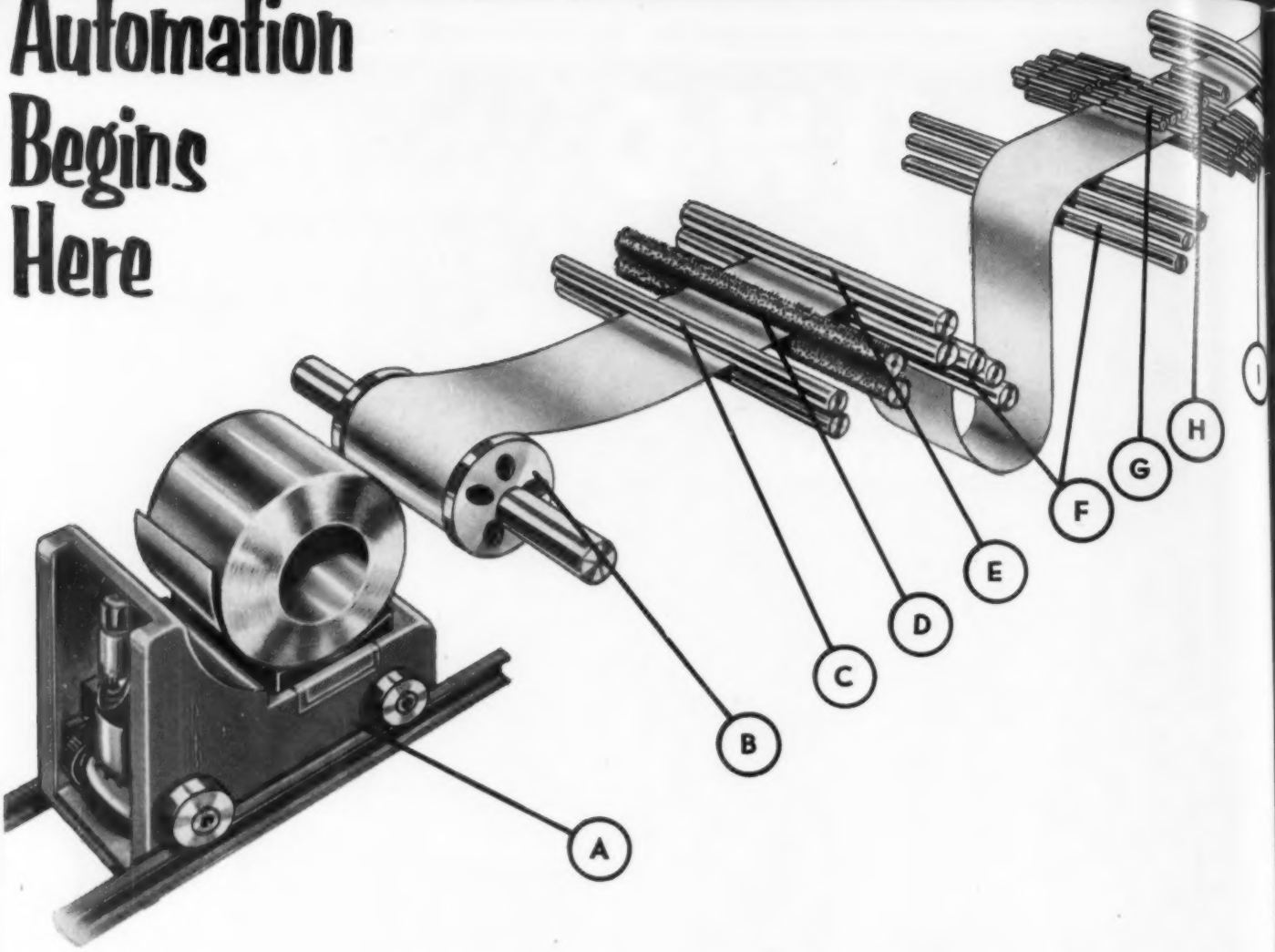
For complete specifications, write for Bulletin 140.

Dealer Representation in Major Cities

EDLUND MACHINERY CO. [A]
DIVISION OF BRADLEY EDLUND CORP.
Cortland, N. Y., U. S. A.

[A] Affiliated with Precision Castings Co., Inc.

Automation Begins Here



Automation—the automatic handling of work in process — permits manufacturers to combat high labor and material costs by boosting man-hour production. McKay has played a large part in this movement by designing and building "automated" equipment for the automotive and steel fabricating industries.

For example, coil feed lines of the type illustrated above were designed and built by McKay for several leading automotive firms. They are used to automatically feed coil stock into square shears or blanking presses, thus eliminating inefficient and laborious methods of manually feeding these machines.

TYPICAL LINE EQUIPMENT

(A) Hydraulic Loading Car for stand-by coil.

(B) Cone Type Coil Holder handles wide range of co and O.D.'s.

(C) Guide Rolls to direct strip into brush rolls.

(D) Brush Rolls with solvent sprays to clean strip.

(E) Driven Pinch Rolls for pulling coil stock and storage loop.

(F) Guide Rolls to support loop.

(G, I, J & H) Feeder unit consisting of Backed-Up er **(G-I)** and pinch rolls **(J)** is powe D.C. drive which is controlled by a m ing device driven from measurin **(H)**. The feeder flattens the strip a curately measures it into open pre or through shear knives.

Line operation is synchronized with the press or sh maximum production. McKay builds these units w sign, speed, and capacity dictated by your job requir

The McKAY MACHINE Company
YOUNGSTOWN, OHIO

McK

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMO FABRICATING AND STEEL M

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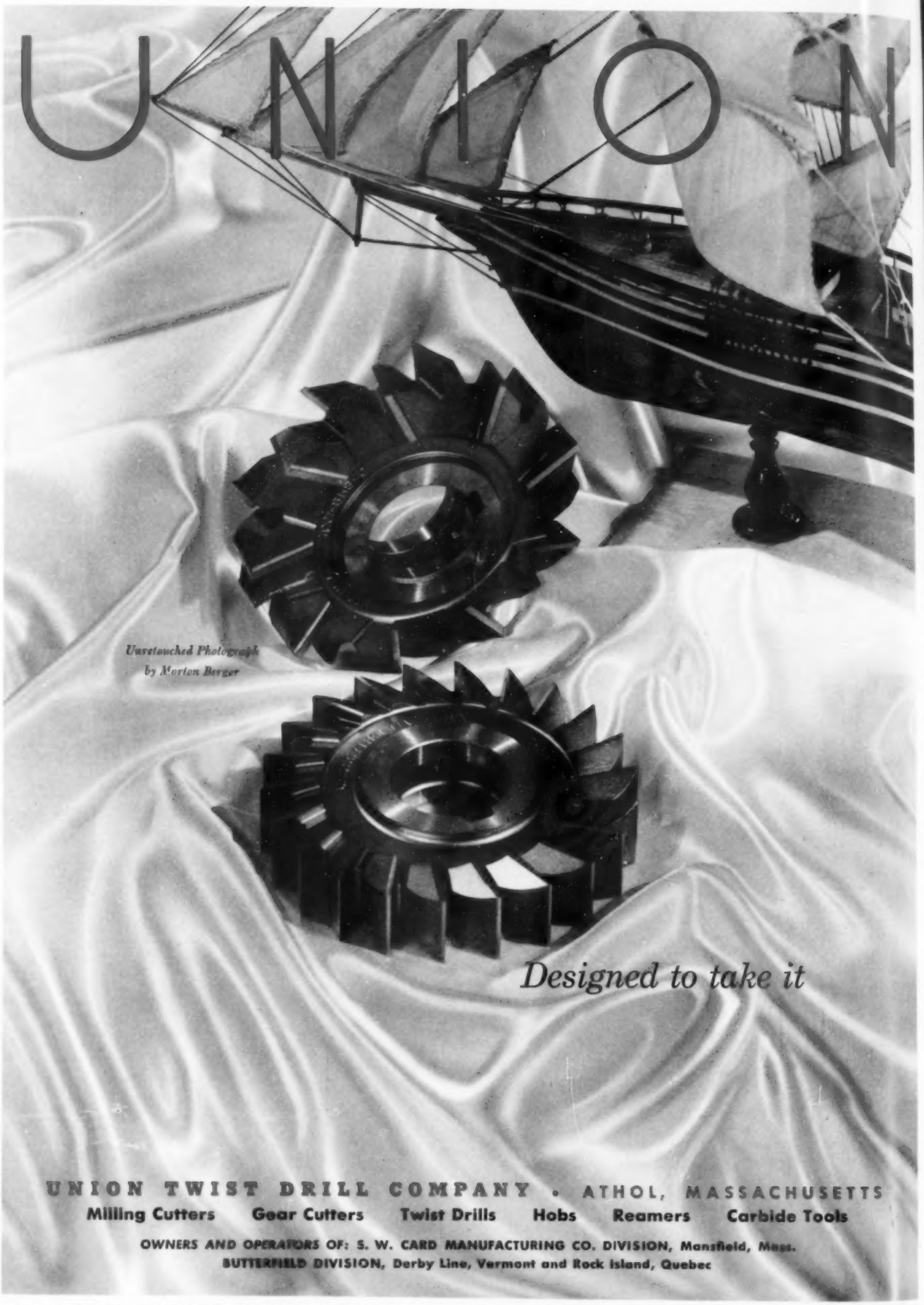
YOUNGSTOWN, OHIO



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GENERAL AMERICAN, with principal offices in Chicago, owns and operates the nation's largest private fleet of freight cars which are leased to many of the foremost industrial companies, and to railroads. In addition, it is a major builder of all types of freight cars, owns and operates tank storage facilities, and is engaged in the manufacture of process equipment and molded plastics.

In pursuance of a program of diversification, General American has acquired the business and assets of the Parker-Kalon Corporation through the purchase of capital stock. The business will henceforth be operated as the Parker-Kalon Division of General American Transportation Corporation.

The present management of Parker-Kalon will continue in charge. The sales and service policies which have won the approval of the many thousands of P-K customers will remain in effect. As always, P-K Fasteners will be sold through P-K Distributors in every industrial area in the United States, Canada and in many foreign countries.

With the far greater resources available through its new ownership, Parker-Kalon will accelerate a program of improvement and expansion. New production and warehouse facilities will be built to meet the constantly increasing demands for P-K fasteners. Engineering and research will be augmented to speed the perfection of new P-K products now in development.

Now, even more than before, you can rely on Parker-Kalon for leadership in fastener design, for consistently high fastener quality, and service in step with your needs.

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Live Center

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High Load Capacity for a Wide Range of Jobs

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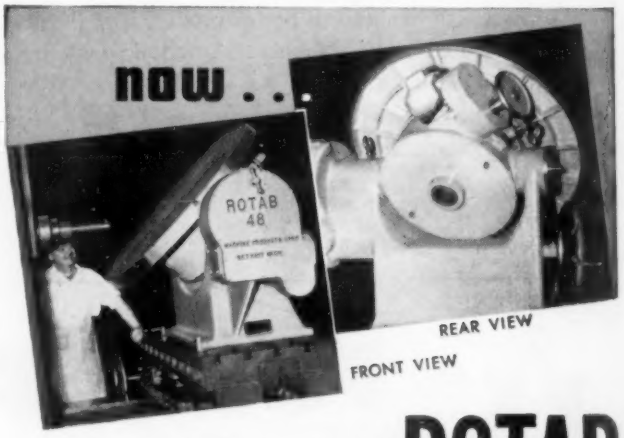

A 48-inch ROTAB

with motor-driven table for fast and easy positioning of work

Now a giant ROTAB!—to give you an extra sized table (48-inch) with benefit of motor-drive to position work fast and easily. The table, with 8 tee slots for clamping work, can be rotated by push of button, and locked to any degree to precision accuracy within 2 min. by vernier graduations. Can also be set from vertical to 30° below horizontal the opposite way. Has one shot lubrication.

● The 36-inch model also available with motor drive. Smaller models—12" and 24"—are set manually.

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GROBET

AGAIN AND AGAIN we learn where process engineers and gage engineers order gages *specially* designed and built when a Federal Catalog Gage, as is, or with slight modification, will perform as well and usually better. We've seen many such gages which were specially designed and specially built which are almost duplicates of gages already in our catalog. In one instance, the gage could have been readily obtained by adapting a Federal stock catalog gage (price $147.00) plus a modest charge ($45.00) for modifying it to the specific use. — What was the cost of the special gage? — $432.00! — That, my friend, is more than twice the cost of the modified Federal gage.

Federal Gages are already *designed* . . . probably *built* . . . and the practicality of their design has been proved through years on the job. On the other hand, the special gages you design and build are expensive and almost certain to have unforeseeable "bugs" which run their costs up even more.

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Largest manufacturer devoted exclusively to designing and manufacturing all types of DIMENSIONAL INDICATING GAGES

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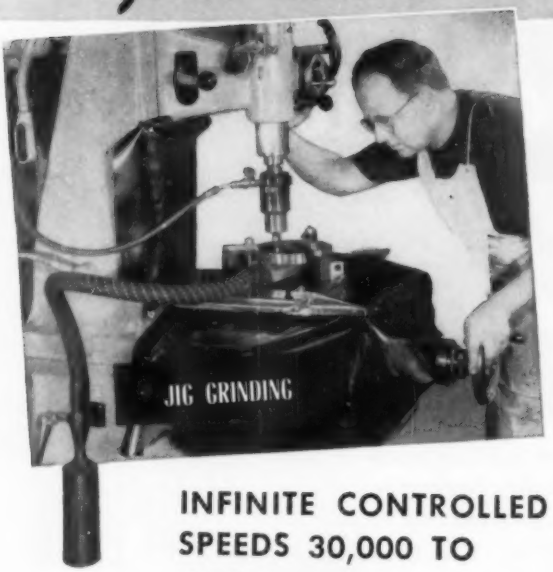
JIG GRINDING ACCURACY *guaranteed**



INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅛" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

*Dependably accurate to "tenths"

Vulcanaire
It's built by toolmakers for toolmakers

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- CROSS SLIDE KNURL HOLDERS
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Inasmuch as we manufacture cams and tools for the trade we obviously do so on a production basis. As a result we offer:

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Tool making with us is a routine matter. Special equipment . . . skilled hands . . . plus know how, enables us to fill orders in a minimum of time.

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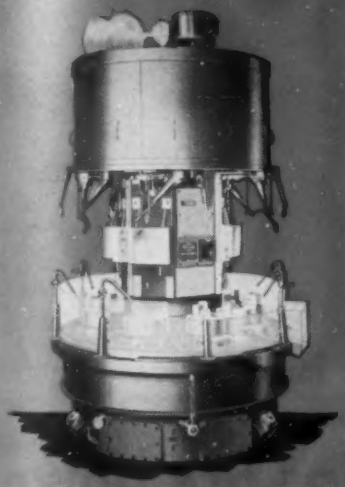
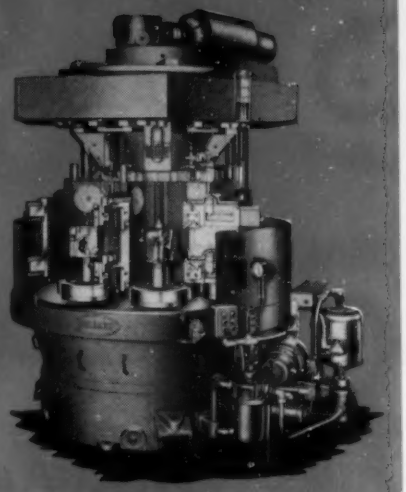


MULT-AU-MATIC

Type "D" — 8" — 12" — 16" with 6 or 8 Spindles, Type "D" 16-23" and Type "K" 6 Spindles — and 6 twin Spindles — 8 Spindles and 8 twin Spindles.

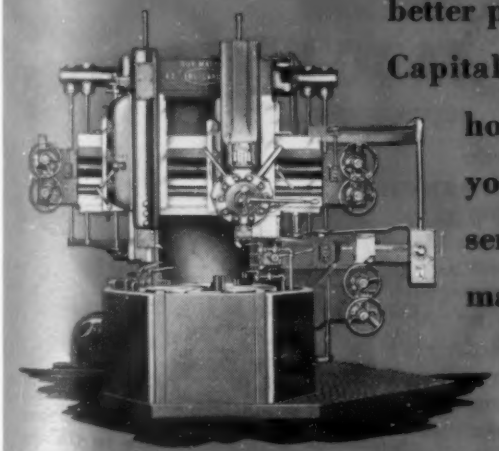


CONTIN-U-MATIC

Types "RD" and "RDH" 3 - 4 - 6 and 12 Spindles in 10" — 14" — 20".

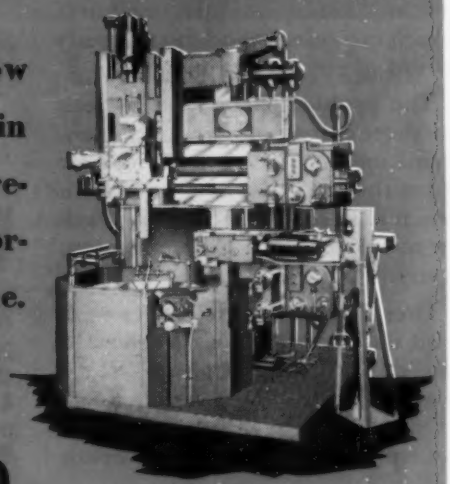
Many complicated and diversified metal working operations are being efficiently performed on Bullard Machine Tools. They speed up production . . . reduce scrap to a minimum . . . produce better pieces at lower cost.

Capitalize on Bullard "know how" as others have—call in your nearest Bullard representative or write for information on the Bullard Line.



CUT MASTER V.T.L.

In six sizes 30" — 36" — 42" — 54" — 64" and 74". The 30" and 36" sizes have two heads while 42" — 54" — 64" and 74" have three heads obtainable in various combinations.



MAN-AU-TROL V.T.L.

In six sizes 30" and 36" with two heads. 42" — 54" — 64" and 74" with three heads.

The BULLARD COMPANY

BRIDGEPORT 2, CONN.

PHONE 6-2511

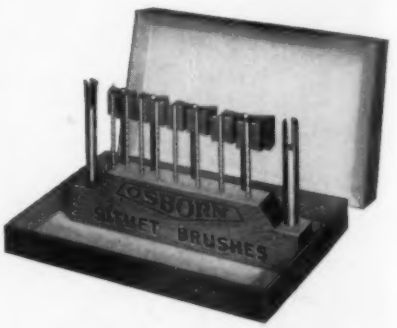
This brush cleans up when the chips are down

Deep down in the threads of these stainless steel coupling nuts are tiny abrasive chips and burrs which can ruin a good fit and costly thread gages.

The problem here was to clean out those chips and burrs *completely.* Hand methods were slow and far from thorough. The inspection bench kept sending too many back for re-working . . . time-consuming, costly.

Then Osborn Situft Brushes were tried and the threads were deburred and "de-chipped" quickly and cleanly every time. Mounted in its holder, the Situft Brush is chucked in the tapping head. Then the brush *threads* its way in at 100 fpm, reverses and threads its way out at 200 fpm . . . the bristles getting down to the roots of the threads and removing all abrasive chips and burrs without a miss.

If you have any kind of a deburring, cleaning or finishing problem, a special Osborn-equipped machine or Osborn brushing machine may be the answer you're looking for. We'd be glad to send you the new free Bulletins on Situft Brushes and Automatic Deburring. Or, if you prefer, why not take advantage of the wide experience of your **O**sborn **B**rushing **A**nalyst to help on your problem. Call him today, or write *The Osborn Manufacturing Company, Dept. K-6, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



Kit of Situft Brushes and holders is available. Variety of brush sizes to suit various applications. Write for bulletin on Osborn Situft Brushes.

Osborn Brushes

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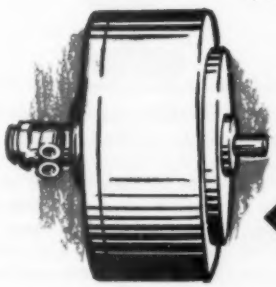
FAST-ACTING, POSITIVE CONTROLLED POWER . . . AT LOW COST



Rotating Air Cylinder

NONROTATING—7 STANDARD MOUNTING TYPES

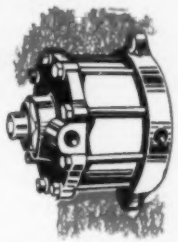
Standard sizes from 1½" to 16" bore; maximum stroke, 18 feet. Special models to meet your requirements.

Logan Features—Larger Ports . . . More Sturdy Construction . . . Maximum Power Without Leakage . . . Permanent Seal Around Piston Rod . . . Standard Models With or Without Cushioning.

ROTATING

Two Standard Styles—Type R with cast iron body; Type K with lightweight aluminum body.

Bore diameter 1½" to 20"; piston stroke 1" to 2"; longer strokes available as special. American Standard adaptations.



Nonrotating Double-Acting Air Cylinder

Consult Logan for your special heavy-duty, mill-type cylinder requirements

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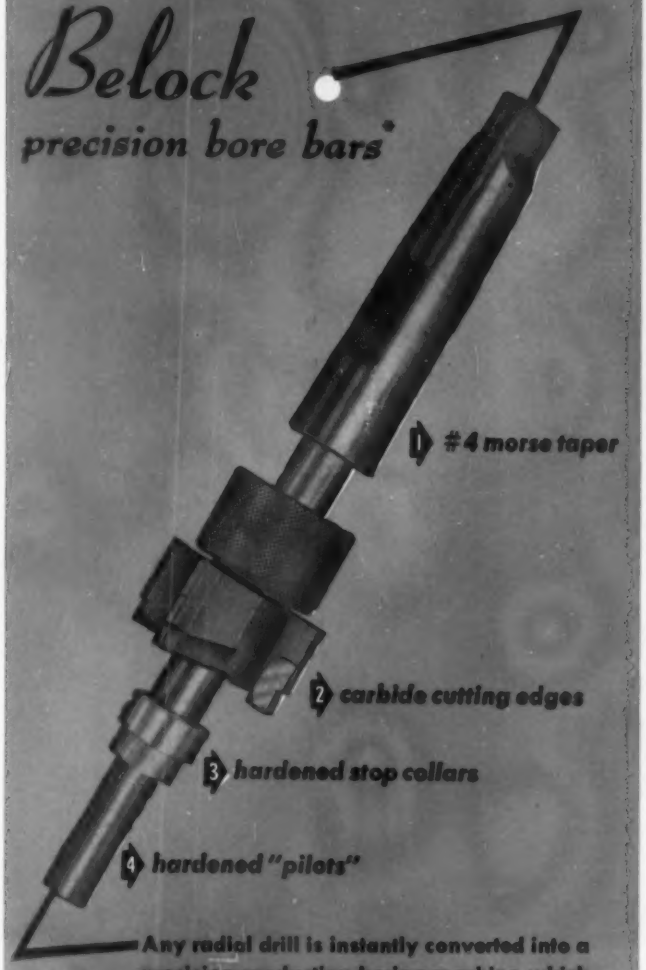
SAVES TIME — Logan — AIR AND HYDRAULIC EQUIPMENT — EFFORT • MOTION

LOGANSPORT MACHINE CO., INC., 839 CENTER AVE., LOGANSPORT, IND.

Now every shop can do precision boring with Belock precision bore bars



Any radial drill is instantly converted into a precision production boring machine which will consistently hold to Jig Bore tolerances. Belock precision boring tools are designed to do a bore and counterbore in one operation, or any through bore to finish size. Belock borebars have rigid carbide cutting tips capable of cutting up to ½" of material at one time. Long life and maintained accuracy is assured; hardened, ground stop collars are provided to prevent overrunning counterbore depths.

Large, expensive "jigs" are no longer necessary. A simple inexpensive "pilot fixture," (which can be made in any shop) when used with this borebar, gives exact duplication of coordinates in every casting. Call the Bore Bar Engineering Service, or write immediately for literature.

Belock Instrument Corporation

COLLEGE POINT • NEW YORK

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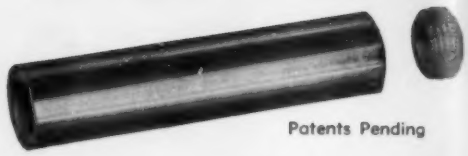
How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

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STURDY BROACHING SERVICE
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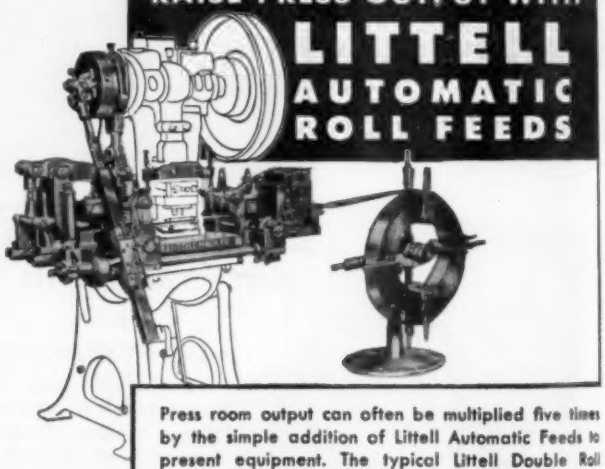
RAISE PRESS OUTPUT WITH LITTELL AUTOMATIC ROLL FEEDS



Installed on old or new equipment

Press room output can often be multiplied five times by the simple addition of Littell Automatic Feeds to present equipment. The typical Littell Double Roll Feed shown here grips the stock on both sides of the die to assure maximum traction and feeding power. Stock is easier to start and finish in progressive die work. No hand feeding at either end of the stock. Rack and pinion drive provides the smoothness and the gradual acceleration and deceleration of feed rolls for a truly accurate feed. Standard Littell Automatic Feeds serve all types and sizes of presses, all standard widths and thicknesses of stock.

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Speed with Safety

ROLL FEEDS • DIAL FEEDS
STRAIGHTENING MACHINES
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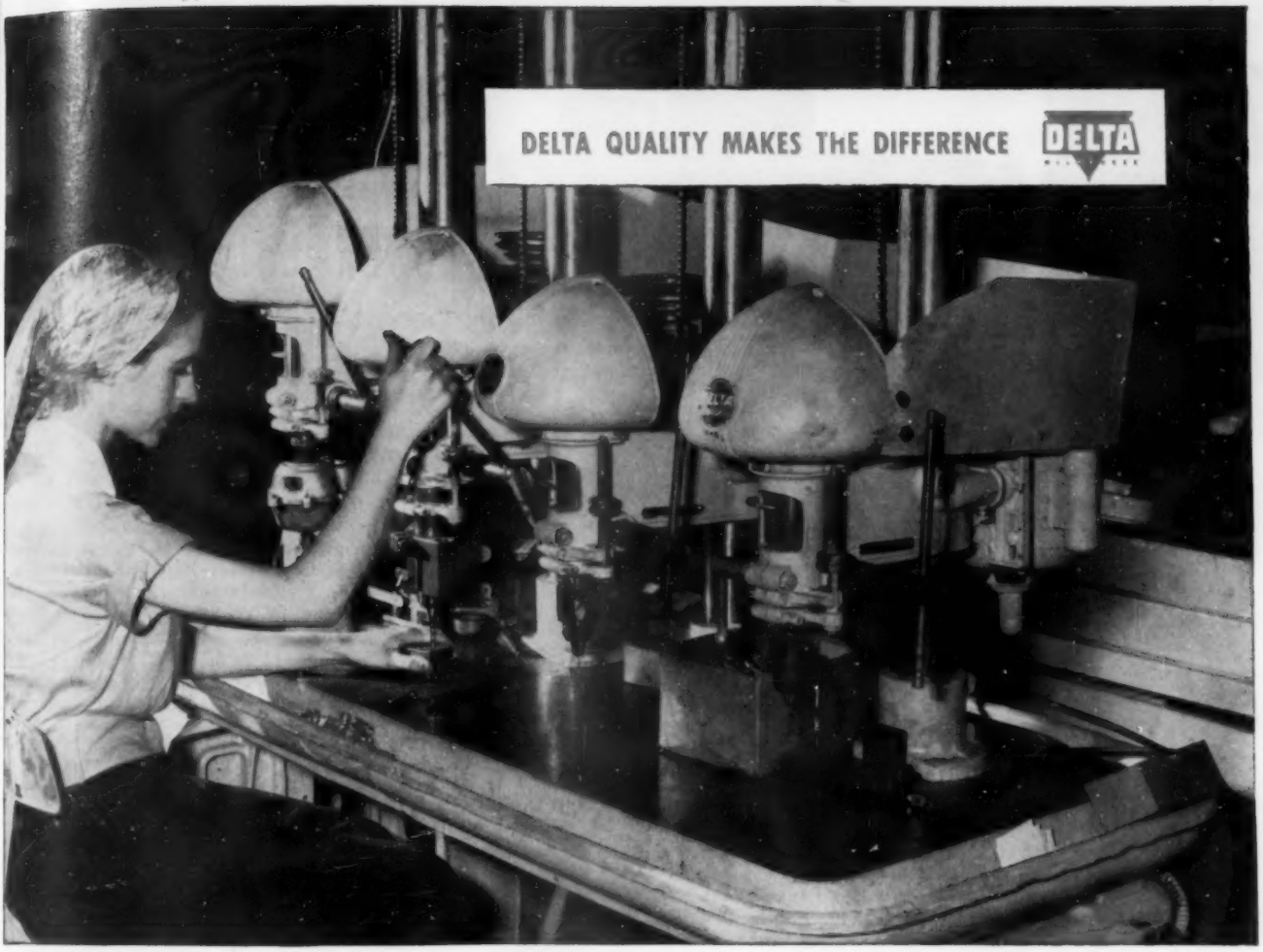


One Operator Plus One **DELTA** Set-Up

HOLLOW MILLS, DRILLS, TAPS AND COUNTERSINKS

AT SKILLMAN HARDWARE

More pieces per hour with less labor cost—that's what Skillman Hardware Manufacturing Co., Trenton, N. J., gets by locating inexpensive Delta tools in groups so that related machining operations can be done by a single operator.

Though Delta tools are inexpensive, they are production machine tools—as accurate as tools costing many times as much.

Here's the testimony of John Strasenburgh, Skillman production foreman: "Of course, since we build locks, our precision standards are very high, and we work as close as .0005", but our Delta tools are accurate, dependable and easy to operate."

These are some of the ways Skillman groups Delta tools:

- . . . two Delta drill presses side by side; one drills, the other taps.
- . . . three Delta drill presses together to drill, tap and counter sink.
- . . . four Delta drill presses—to hollow mill, drill, tap and counter sink.
- . . . two 17" Delta drill presses mounted on single column with opposing spindles drilling and reaming same hole in one set-up.

Light, mobile, dependable Delta tools are easily adapted to hundreds of production jobs. There's a wealth of such performance data available to you. Ask your Delta dealer—he's in your Classified Phone Book under "Tools," "Machinery" or write for Catalog AB52 to Delta Power Tool Division, Rockwell Manufacturing Co., 620M N. Lexington Ave., Pittsburgh 8, Pa.

DELTA quality power tools

Another Product of **Rockwell**

modern machines demand CLOSER tolerances

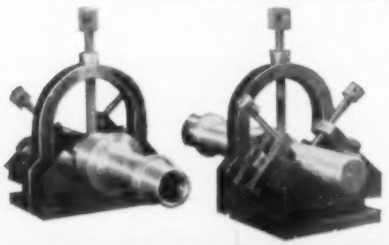
THIS "BRAIN CHILD WITH A MEMORY" can perform and check *14,000 computing operations a minute, without tiring or complaining! It's IBM's Electronic Calculator, Type 607, designed for use by business and industry. Now multiple machine operations can be done and checked in a single operation.*

MODEL 3000

dimensions 2-7/32" x 3¾" x 2-5/16"
Will nest up to 2½" diameter in the "V". Materials, hardness, stabilization same as Model 5000.

features Matched pairs are guaranteed to be square and parallel and concentric to each other to an extreme degree of accuracy.

Key slot in base is located on center and parallel to "V" to within .0002. There is a hole of ⅝" diameter thru the center of the "V" for picking up the center within .0002. Block is grooved all around for easy clamping to machine or layout plate. Two hold-down cleats are furnished with each block. The hoop clamps are hardened for long life.

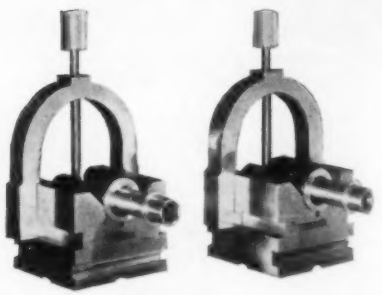


MODEL 5000

dimensions 4-3/16" x 5⅛" x 5⅜"
Will nest up to 4¼" diameter in "V". Made of forged chrome-moly alloy steel, accurately heat-treated and drawn to obtain a hardness of 58 to 60 Rockwell C scale. UNI-V-BLOCKS are subjected to a closely controlled metallurgical phase stabilization process, used for attaining a complete dimensionally stable condition in the block—a costly process used only by manufacturers of the highest quality master checking tools.

features Matched pairs are guaranteed to be square and parallel and concentric to each other to an extreme degree of accuracy, never before obtained in blocks this size.

Key slot in base is located on center and parallel to the "V" within .0003. Block is grooved front and rear for easy clamping on a machine table and layout plates. Husky clamps are provided for holding piece in the "V"; clamps are heat treated for long life.



PRECISION TOOL

PRECISION TOOL & MFG. CO. OF ILLINOIS
1305 So. Laramie Ave., Cicero 50, Ill.
phones: BIshop 2-2921
OLympic 2-9076

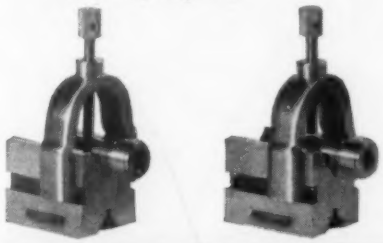
new UNI-V-BLOCKS

Guarantee GREATER ACCURACY!

MODEL 1250

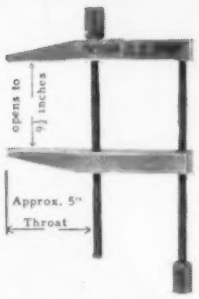
dimensions — 1¼" x 1¼" x 1⅝". Made of high grade tool steel, heat treated to 58/60 Rockwell C scale.
Will nest up to 1" diameter.

features — Matched pairs are guaranteed to be square and parallel and concentric to each other within .0002.
Two heat treated and hardened hoop clamps are furnished with each pair. Sold only in pairs.



Machines that "think", electronic "brains" that do all but talk are changing the face of industry. Dimensional control is now a must. UNI-V-BLOCKS were engineered to meet this need in the search for perfection. They hold to tolerances never before obtained in tools of this size. Made of forged Chrome Moly, they are guaranteed to "stay put." Special low temp treatments give them stability found only in master gauge blocks. They *are* the finest—check them yourself.

make tough problems easy



MODEL TC9500
CLAMPS

BIG, NEW, RUGGED shop clamps that save time, energy and money are these Precision clamps that hold everything from ⅝" to 9½", with a throat depth up to 5". They are case-hardened and Mar-Tempered for hard use. Smooth, free, straight clamping action is guaranteed. No more "juggling" by your high priced mechanics. We also make a complete line of toolmakers bench parallel clamps.
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Mail the coupon today for literature on Precision Uni-V Blocks and Precision Clamps.

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Please send detailed specifications and literature without obligation:

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FIRM NAME.....

ADDRESS.....

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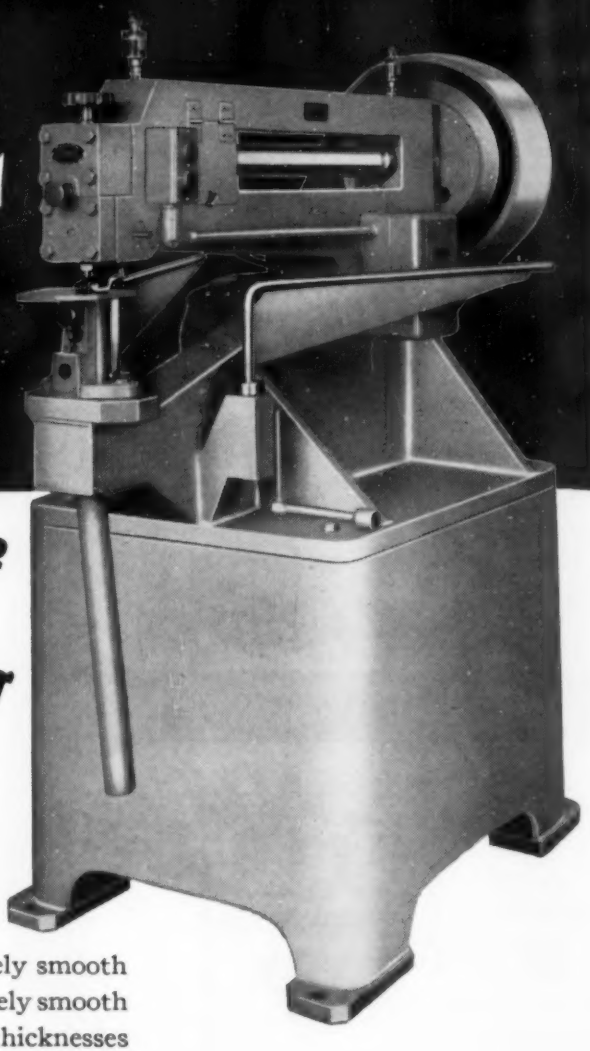
Look to PRECISION *for Quality you can trust*

ACCO products

CAMPBELL Nibbling Machines

Model 2524
CAMPBELL
Nibbling Machine



How Cutting from a Template is Simplified with a CAMPBELL Nibbler

• With the CAMPBELL Nibbling Machine a template clamped above the work guides the punch accurately to cut any shape or design. The cut can be made in any direction without head adjustment, thus permitting the operator to feed the work with both hands.

CAMPBELL Nibbling Machines leave a relatively smooth edge, which requires finishing only when an absolutely smooth edge is required. They can be furnished to cut all thicknesses of metal up to ½". Cutting speeds on various models can be quickly changed to suit the types of material to be cut and the various thicknesses. Drive is completely enclosed for safety.

ACCO

CAMPBELL makes a complete line of Nibblers.
One of them could save money for you. Write for literature.
Tell us your job and we'll make recommendations.

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and
Nibblers

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BAY STATE SALUTES CATERPILLAR TRACTOR CO. . . . for brilliant design in this No. 6 shovel. Here indeed is a remarkable achievement of surging power with maximum compact maneuverability.

Each day, BAY STATE abrasive products play important parts in producing up-to-the-minute mechanical triumphs such as this. Each day too, more manufacturers are realizing the tremendous faith they can place in BAY STATE'S complete line of abrasive products and its excellent engineering service.

Call your BAY STATE distributor for the solution to any problem that involves your production grinding.

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MANUFACTURERS OF ALL TYPES OF QUALITY GRINDING PRODUCTS

now, there are **MORE MEN**

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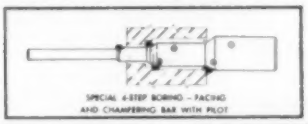
GET MORE FROM YOUR PRODUCTION AND MULTI-STEP BORING BARS AND . . .

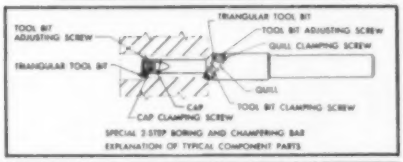
SAVE UP TO 70% IN TIME AND DIAMOND WHEEL WEAR, GRINDING TOOL BITS USE EVEREDE BORING BAR QUILLS

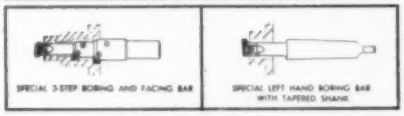
Get the savings and increased precision production which so many of America's top-drawer plants have standardized on: ADAPT EVEREDE SOLID TRIANGULAR TOOL BITS OF CARBIDE HSS, TANTUNG, OR STELLITE TO YOUR PRODUCTION AND MULTI-STEP BORING BARS . . . BY INSERTING THESE NEW EVEREDE QUILLS.

. . . they give you famed EVEREDE Boring, with the only boring bars using Pre-Formed, READY TO USE, Triangular-Shaped tool bits of Solid Carbide, HSS, Tantung or Stellite, with rake and clearance angles automatically provided.

WIDE RANGE OF SIZES & DIAMETERS







Quills are available in wide range of sizes, diameters and lengths. Easily inserted into boring bars. "V"-shaped nest for Triangular Tool Bit eliminates side-creep. Back-up prevented by back-up and adjusting screws supplied with the Quill. Precision relocation of Tool Bits after sharpening is simplified by "V"-shaped Tool bit nesting. This nesting automatically provides distance between multiple Tool Bits when they are set to bore the correct diameters.

It will pay you to get all the free details . . . just write for EVEREDE QUILL BULLETIN or attach this advertisement to your letterhead and mail to us.

SPECIAL BORING BARS MADE TO YOUR SPECS

Complete facilities. Free estimates. Send drawings or sketches of parts or tools.

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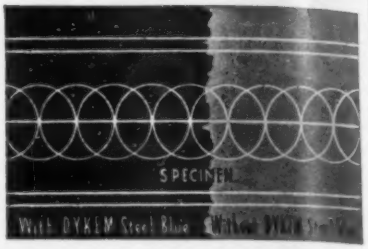
DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout show up in sharp relief and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2303D North 11th St., St. Louis 6, Mo.

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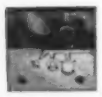
TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 133.

Pressure Blast Application #68

MALE DIE CAST DIE



FEMALE DIE CAST DIE

Pressure Blasting of this die casting die cuts hand finishing by 75% . . . reduces break-in time from 1 day to 2½ hours by aiding in good lubrication control. The use of pressure blasting in new die manufacture and die maintenance makes dies last longer . . . improves finish of die cast parts, too!

ONLY PRESSURE BLAST GIVES YOU 2-SPEED WET-BLASTING

FREE . . . Learn what PRESSURE BLAST can do for you! Die and Mold Polishing, Blending Grind Lines, Deburring, Heat Treat Scale Removal, Honing of Cutting Tools, Pre-plating Cleaning . . . Hundreds of proven, money-saving applications!

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your expensive dies and machine parts

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DOWEL PINS

Acme Dowel Pins break before bending or mushrooming—thus saving expensive equipment from ruin through misalignment. Order standard sizes from stock. Attractive prices on special sizes and large quantities.

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Makers of Standardized Jig & Fixture Bushings
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THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

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now, there are MORE MEN with holes in their heads!

announcing:

MADISON GUN DRILLING

by **MADISON INDUSTRIES, INC.**

(affiliated with Madison Manufacturing Company)

This affiliation provides industry with an unusual hole-making team. The long-time specialization of the Madison Manufacturing Company in inner diameters is now expanded through this affiliation to offer industry greater versatility in meeting today's exceptional production demands.

Now, Madison Adjustable Boring Tools for rough and finish boring of inner diameters to wide or close tolerances, *and* Madison Gun Drills for "deep hole" drilling to the smaller diameters, are offered you through the *same* representatives, from the *same* background of engineering "know how" and service.

Write for information on Madison Gun Drills today

MADISON

MADISON INDUSTRIES, INC.

Post Office Box 131 MUSKEGON, MICHIGAN

"Packaged Precision"

Measures high-precision holes to fractions of .0001"

Ready to go to work –

anywhere—at machine, inspection bench, selective assembly, Comtorplug can be wherever needed —instantly.

any time—hand Comtorplug to the operator and you're in business! No need for preplanning, installation of wires or hose; no headaches of electronic gadgets.

by anybody—in a few minutes any worker gets the knack of Comtorplug—its automatic features assure accuracy, and uniformity regardless of human variations—no training course or experience needed to use Comtorplug precisely.

Prominent in the Jet Engine Program

Any new, fast-moving program appreciates Comtorplug because it's so adaptable, accurate, rugged. Ideal for Statistical Quality Control. Send for details of this unique patented gage.

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BAR STOCK
Talide
(TUNGSTEN CARBIDE)
THE WORLD'S HARDEST METAL
1 Many times more durable than steel, it adds years of life to the wearing edges of tools, dies, machinery and equipment.
2 Hard as a diamond and almost indestructible, it triples output per man and per machine.
3 New heavy-metal alloy (17.5 specific gravity) has proven best for atomic radiation screening and for applications requiring maximum weight in minimum space.
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METAL CARBIDES CORPORATION
YOUNGSTOWN 7, OHIO
BLADES
TOOLS
BUSHINGS
ROLLS
DIAMOND WHEELS AND DRESSERS
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Originators and Manufacturers of Helical Reamers and End Mills

Helical Taper Pin Reamers Shipped by Return Mail

The

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Company

400 Main Street, Manchester, Conn.

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Powrarm

will cut your production time! PowRarm speeds and simplifies every operation:

PowRarm Attachments Hold most any work pieces. A complete variety of attachments are available custom built fixtures quoted on at no obligation.

Basic PowRarm unit Comes in 3 styles for light, medium or heavy industrial uses. Mechanical and hydraulic PowRarms available.

MODEL 301

- PowRarms are fully guaranteed!
- Holds work at any angle in horizontal, vertical or co-axial plane.

- PowRarms are used from coast to coast by the nation's top industries!

It's a third hand!

This girl is using a PowRarm 301 model for a "medium duty" job load! See how the PowRarm holds the work firm in any position—frees both hands for work—more production. PowRarm means faster—simpler operations.

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Please send me information on Wilton's PowRarm!

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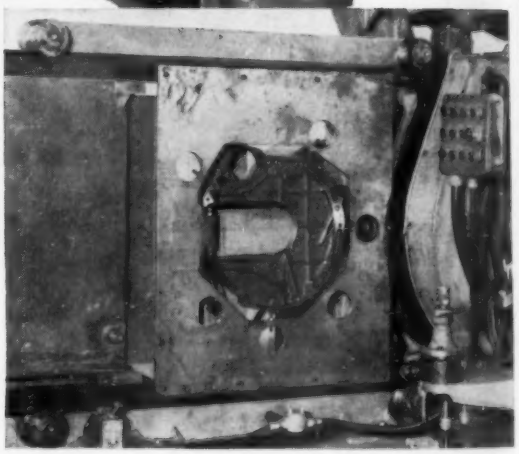
IT GRINDS TWO SURFACES

For the Price of One!

BESLY

DOUBLE SPINDLE GRINDER



At a production rate of one a minute, this specially designed Model 226-30″ Double Spindle Besly grinds *both sides of torque converter plates at the same time.* With stock removal of .020″, accuracy is .003″ for parallelism and .006″ for size.

This is another example of how Besly grinders are paying off—in this case in higher production for a leading automobile manufacturer. Besly's success in matching the right machine design and the right abrasive to each of many different grinding operations and metals, including the hardest of alloys, is due to over fifty years experience in the grinding field. Our engineers are at your service.

Tailored to Fit the Job . . .

Special jig which holds torque converter plate castings is fed between abrasive discs by long hydraulic piston and cylinder, and oscillated for faster production and greater accuracy. Oscillating movement of jig on slide is controlled by a system of limit switches, timers and solenoid valves. Hydraulic feed of the abrasive discs against the casting is limited by a predetermined stop. Coolant is supplied to the work through the center of the spindles.

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CORPORATION
Established as CHARLES H. BESLY and COMPANY in 1875
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BESLY GRINDERS and ACCESSORIES
BESLY TAPS, DRILLS, REAMERS, END MILLS
BESLY-TITAN ABRASIVE WHEELS

Let us silence for a moment the torrents of words on bombs and baseball, taxes and toothaches, to think about the greatest message of all time:

"Peace on Earth, Good Will Toward Men"

Wishing all our friends a Merry Christmas,

NILSSON GAGE CO., INC. POUGHKEEPSIE NEW YORK

RADIUS FORMING TOOLS

"TRU-LINE" PROFILE DRESSING TOOLS

IMPREGNATED DRESSING TOOLS

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"TRU-THREAD" THREAD DRESSING TOOLS

DIAMOND GRIT TOOLS FOR THREAD DRESSING

INDUSTRIAL DIAMONDS

"Smash the Great Diamond, Before My Eyes!"

Vasilica was undoubtedly one of the most beautiful women in the whole world. Ali Pasha, Khedive of Egypt, was sure of it, and for such a treasure, what gift more fitting than this great diamond!

Treasured for centuries by Indian princes, it had been presented to Lord Piggott when he was Governor of Madras. When he died in 1770, it had been sold for $50,000 to a London pawnbroker who organized a lottery for the "Great Piggott Diamond" and saw it won by a poor clerk who quickly sold it and disappeared.

Recut to dazzling brilliance, it was presently offered to Ali Pasha who happily paid $150,000 for it and said, "Now, I have *two* great treasures—Vasilica and the great diamond."

But, Ali Pasha also had a deadly enemy, Raschid Pasha, who hated him and coveted his treasures and whose trained assassins awaited—and struck.

Realizing that his beloved treasures might now fall to his enemy, Ali gave one last command: "Smash the great diamond—before my eyes, and my dear wife, let her be strangled." But, while the slave was hammering the jewel to dust, Vasilica quietly slipped away and escaped.

Diamonds have played many such dramatic parts in the pageant of history, but today their greatest role is in the field of industry. And, for 43 years we have been serving industry by importing fine diamonds and making fine diamond tools. Our field engineers are at your service.

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33 West Street, Bloomfield, N. J.

WHEEL TRUEING TOOL COMPANY OF CANADA, LTD.
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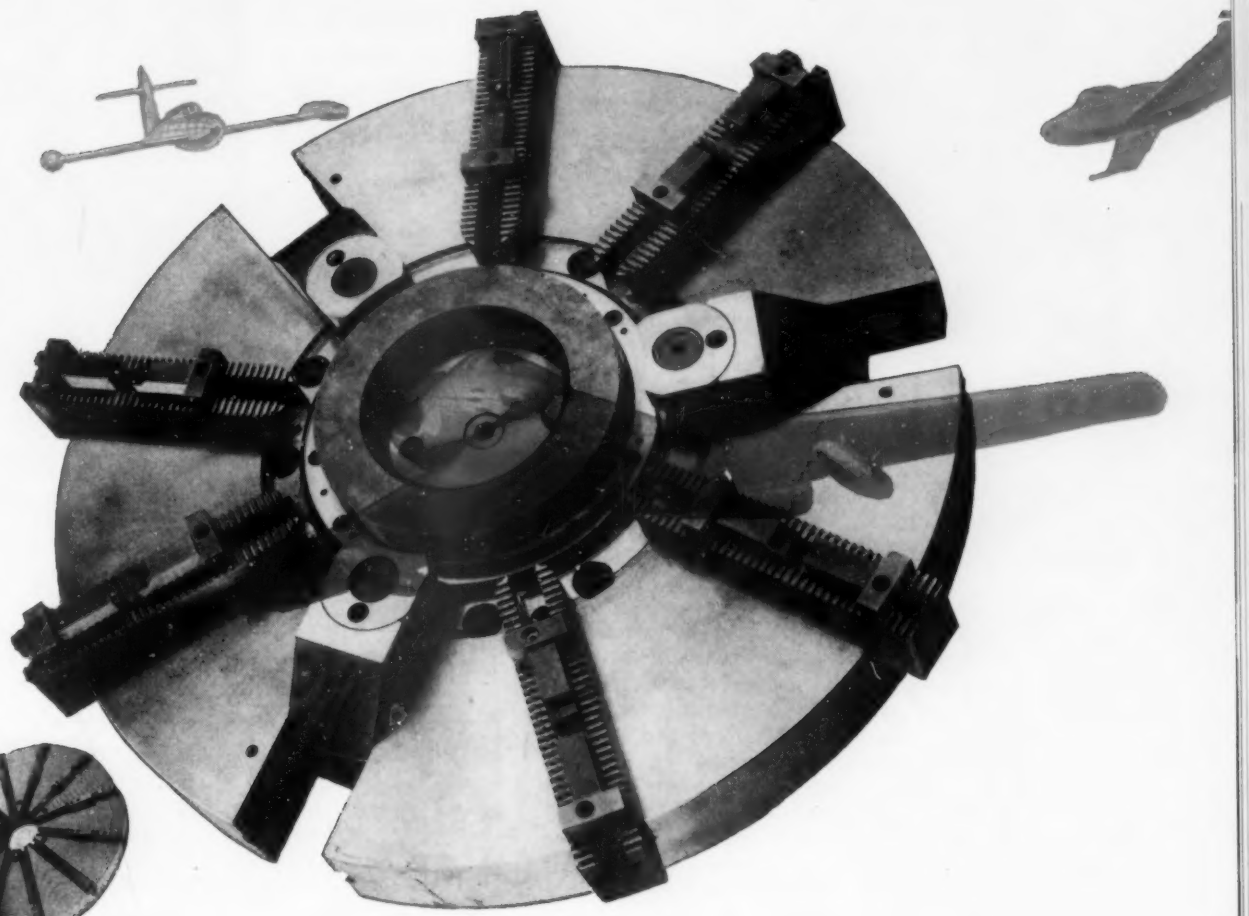
Jet Engines create *chucking* problems



The Cushman Chuck Company has engineered and designed an entirely new and tested approach to the problem of holding jet engine discs and rings. These new chucks have been developed in strict accordance with the principles of rapid-production techniques and chucking rigidity *without* distortion.

Designed for both hand and automatic chucking operations. Engineered to your requirements.

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A WORLD STANDARD FOR PRECISION

DIAMONDS

Swanson TURRET INDEXING UNIT

Save time, money and manpower in designing and building special, automatic machines for manufacturing operations on small and medium parts.

Swanson

These ready-made, self-contained turret indexing chassis are available in a wide range of turret diameters, speeds, and stations. By providing a "packaged" intermittent motion unit, they eliminate a large part of the time and cost involved in special automatic machine design and construction. They provide a unit ready to go to work on an infinite variety of special jobs, such as staking, punching, soldering, assembling, piercing, etc. Any operational device may be mounted in any position around the turret on standard, adjustable mounting brackets or to the stationary turret center plate. Large operational devices may be mounted on optional floor base plate. Smooth, trouble-free indexing is by uniform acceleration cross-over cam. A positive locking device guarantees accurate positioning at each work station.

Write for Bulletin T4.

The Swanson Turret Indexing Unit is one of several precision products developed and built by Swanson to help industry shoulder ever increasing manufacturing costs without impairing quality of product. In a third of a century, Swanson special machines have increased output and improved precision in hundreds of operations.

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V-Liner Inspection Unit
V-Liner Concentricity Checking Fixtures
Memory Devices for Automatic Machines
Feeding Hoppers and Positioning Devices
Filling Machines

Engineers and builders of special precision machinery

SWANSON
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Quality since 1919

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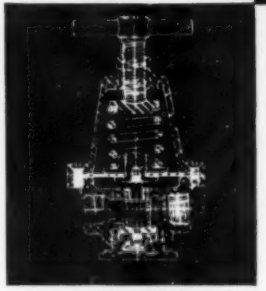
a high quality low maintenance cost
PRESSURE REGULATOR

It's made of A.C.R.'s new miracle alloy VOLLIDIUM!



Available in both non-bleeding and self-bleeding models. **acro** regulators are sensitive and accurate while outperforming all other regulators. It is truly the highest capacity regulator on the market.

write or wire for full information.

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CORPORATION
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Take the GLARE out of Micrometer Reading

with the *"Lustro-Chrome"* MICROMETER

MEASURE TO 1/10,000 th

ALL GRADUATIONS ARE WELL-DEFINED BLACK LINES ON DULL CHROME SURFACE WHICH MEANS EASIER AND SURER READING, EVEN IN POOR LIGHT.

GUARANTEED ACCURATE WITHIN ONE HALF OF A TEN THOUSANDTH OF AN INCH.

THE CHROME SURFACE IS EXTREMELY HARD AND NON-PEELING. IT PROTECTS THE TOOL INDEFINITELY FROM RUST AND DISCOLORATION.

DROP-FORGED MODEL WITH CHROME FINISHED MICROMETER HEAD, 10th VERNIER, FROM $9.25 UP.

No. 901 C 0-1" size with LOCK NUT and RATCHET and 10th vernier as shown $13.25

This tool with TUNGSTEN CARBIDE tipped anvils $15.75

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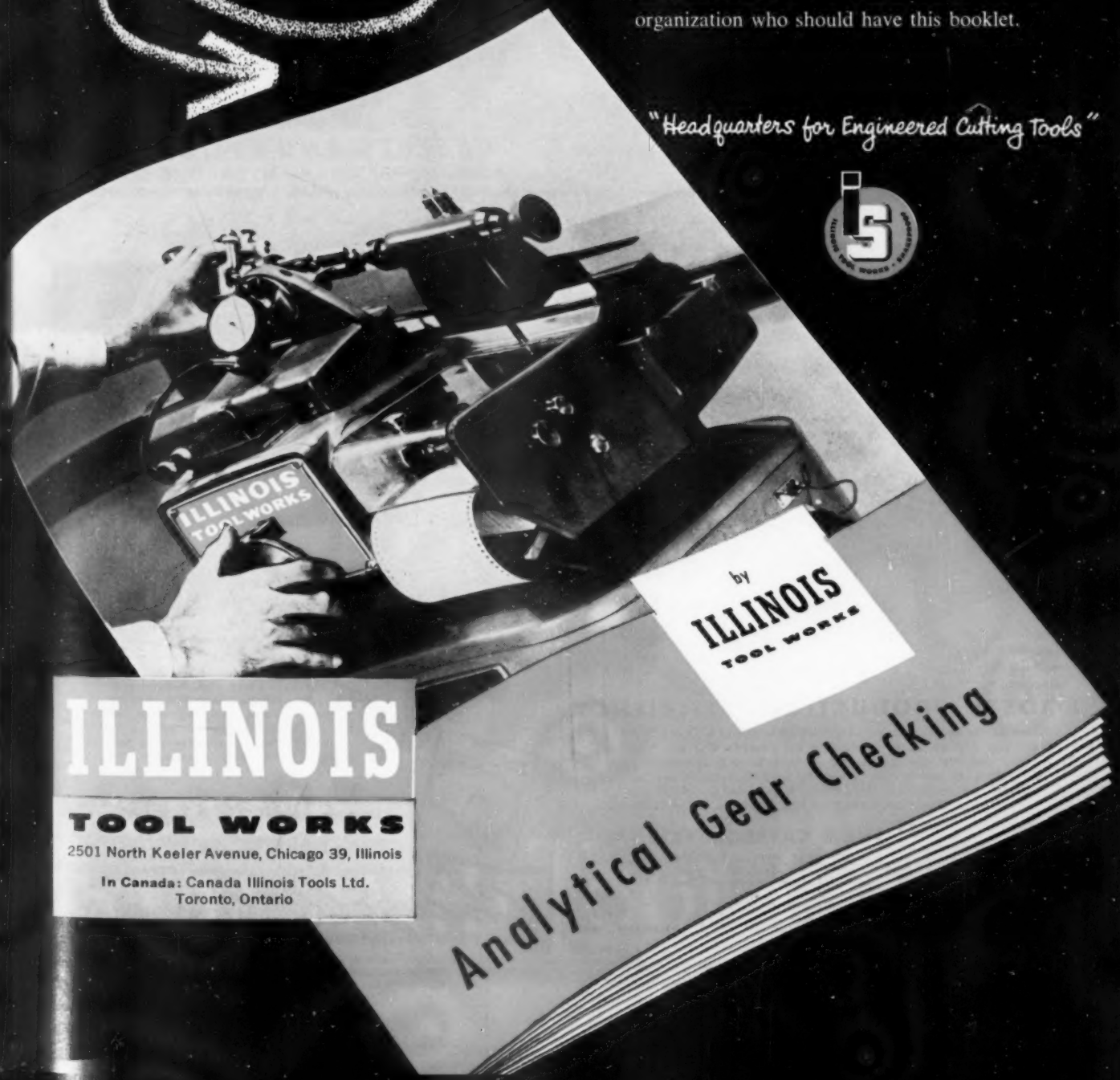

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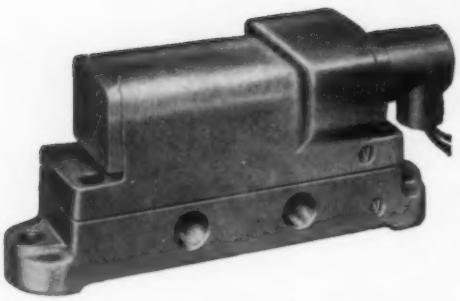

NOPAK Model "V" Type AR, 4-Way Pilot Operated Slide Valve. Unbalanced piston shifted by energizing a normally closed 2-way solenoid pilot.

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NOPAK Model "V" 3-and 4-Way PILOT OPERATED SLIDE VALVES

Pilot Pressure or Bleeder Operated . . . these unique valves permit an infinite variety of cycling in the direct or remote control of continuous or intermittent cylinder action. They may be energized by means of 2-way hand, cam or foot poppet valves or with solenoid pilot or bleeder valves. Light weight, all-aluminum construction, simple design and small size make them extremely versatile, and adaptable to many uses which other valves cannot fulfill. Operate at air pressures from 20 to 150 psi.

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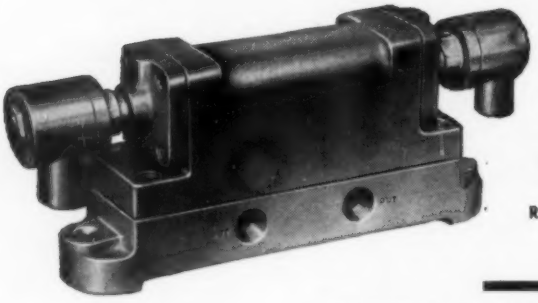

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DESIGNED for AIR and HYDRAULIC SERVICE

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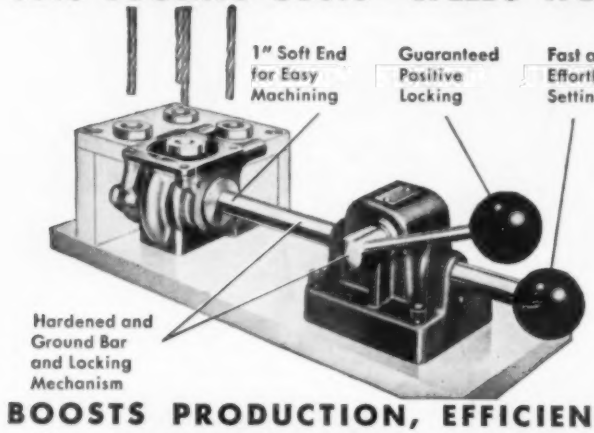
CUTS TOOLING COSTS—SPEEDS WORK


1" Soft End for Easy Machining
Guaranteed Positive Locking
Fast and Effortless Setting
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Now—at the request of industry—we offer the new "Grip-Master" Screwless Fixture Lock, applicable for fixtures and jigs used in drilling, milling operations, etc. It incorporates the same high-quality locking mechanism proved by industrial use in the famous "Grip-Master" Screwless Drill Press Vise. Pays for itself quickly by increasing production, cutting tooling costs, etc. See your Dealer, or write for details.

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LOWER THE BOOM ON COSTS

SET RIVETS FAST

2 at a time with the Chicago "214"

• With every press on foot pedal Model 214 Chicago Double Rivet Setter automatically feeds, inserts and clinches two rivets. 14-inch throat accommodates large assemblies. Handles 9/64" diameter or smaller steel tubular rivets — lengths to 7/8". Quick Change Rotary Type Hoppers and Raceways permit 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to versatility. For help with fastening problem . . . send sample assembly (or a blue print) for free fastening analysis.

FREE CATALOG contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

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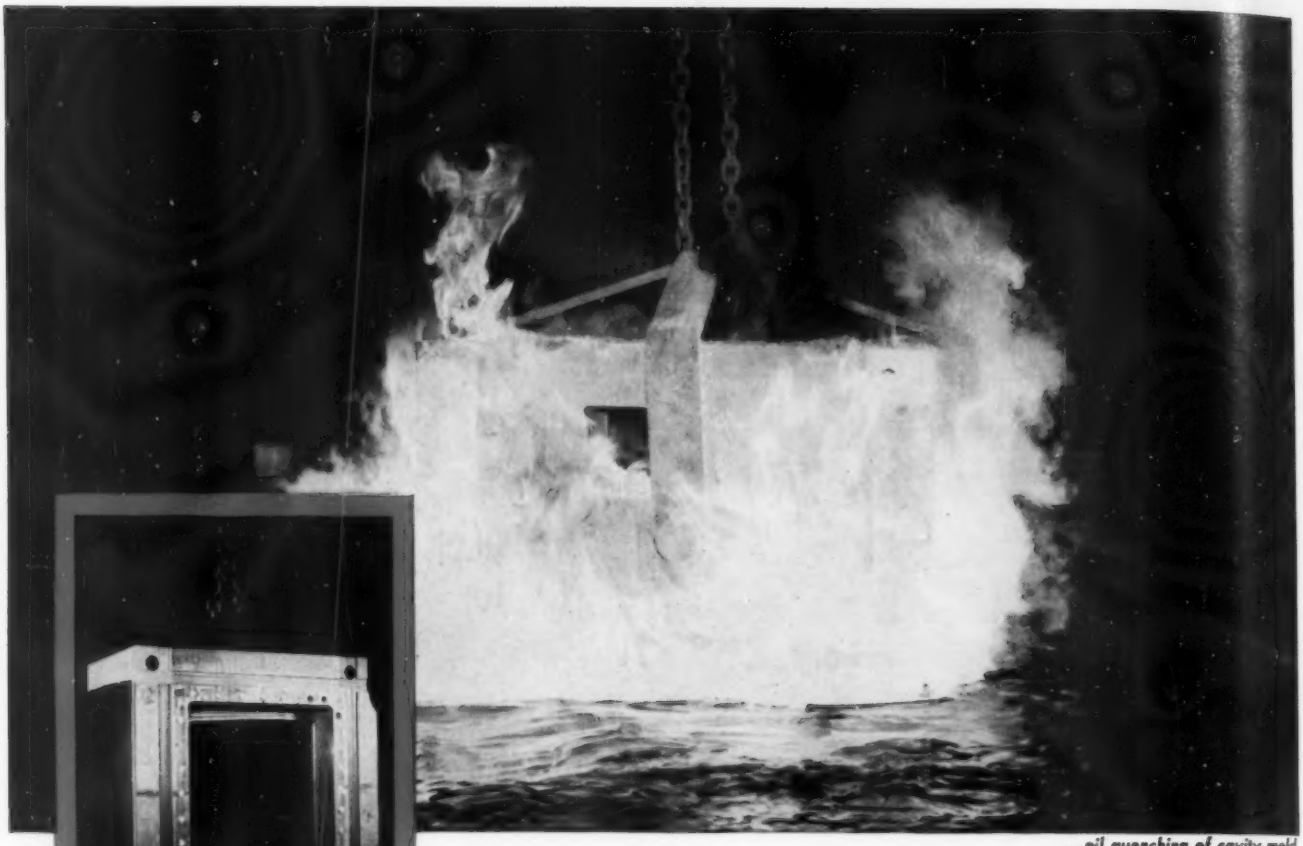

..oil quenching of cavity mold

LINDBERG STEEL TREATING HELPS MAKE BETTER TELEVISION CABINETS

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1977 North Ruby
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On Chicago's west side, one of the largest sets of plastic molds in the world is producing 21″ Motorola television cabinets at a rate of more than one every five minutes.

These molds, designed by Chicago Molded Products Company in cooperation with Motorola, and heat treated by Lindberg Steel Treating Company, weigh more than five tons . . outside dimensions are 40″ x 43″ x 36″ . . and they're worth $75,000 a pair!

The production of such a set of molds is a perfect example of team-work by American industry. Crucible Steel Company poured the ingots, and pressed them into huge blocks each weighing 13,900 pounds. The R. O. Schulz plant in Elmwood Park, Illinois, did the machining and polishing.

Next, came the heat treating . . the finished molds had to be treated to precisely the right hardness . . for they had to withstand the washing of plastic materials . . and they had to be tough enough to stand up under the terrific pressure of the 1500 ton compression molding press.

At this point Lindberg metallurgists and heat treaters went into action. There could be no trial runs . . no mistakes, or $75,000 worth of molds quickly could become $600 worth of scrap metal.

Heat treating specialists selected the proper furnace, specified the correct heating temperature, the necessary time at heat, the right procedure for quenching. "Operation Motorola" went off without the slightest hitch. Within hours after tempering, the molds received final surface polishing . . in a matter of days they were forming cabinets for Motorola TV sets.

Lindberg Steel Treating Co., and its large staff of metallurgists and heat treaters are available to consult on *your* heat treating requirements . . whether your problem is simple or "almost impossible."

A case history of Lindberg Steel Treating Co. service to American industry

LINDBERG STEEL TREATING CO.
1977 North Ruby St., Melrose Park (Chicago), Illinois Phone Fillmore 4-4080

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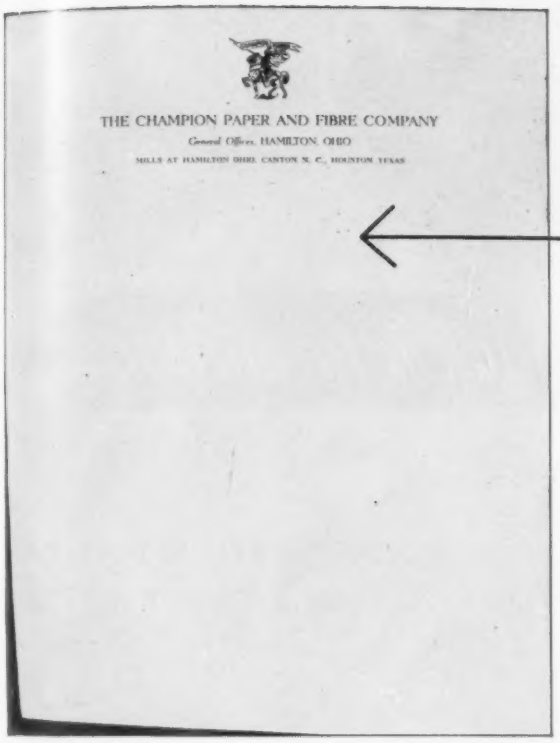
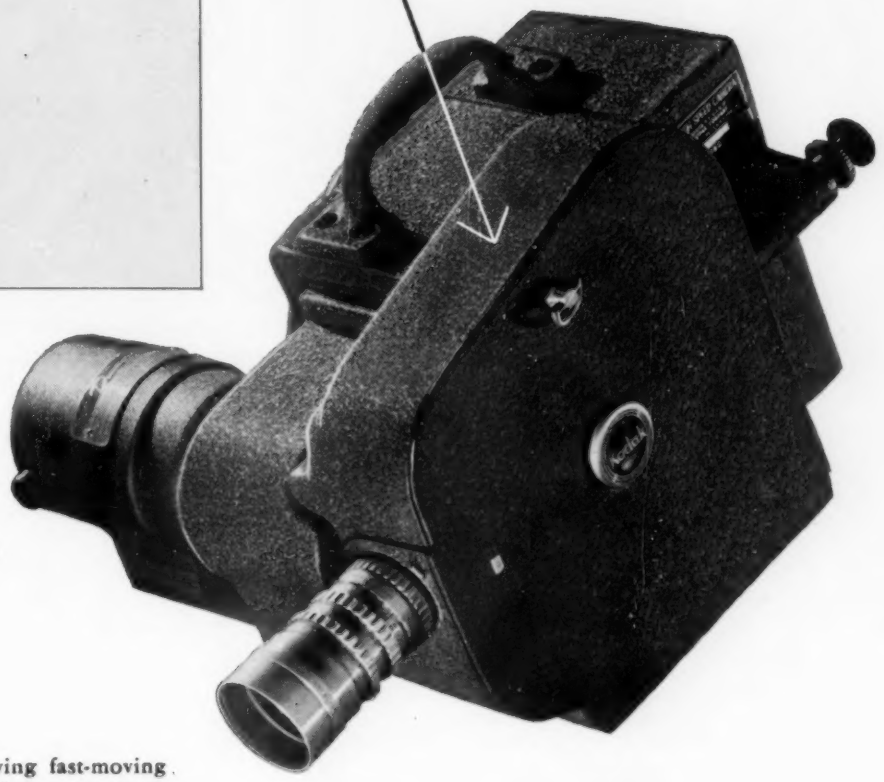


Everyone knows this is a fine brand of paper

This camera helps make it so



Sometimes problems involving fast-moving mechanical action or fluid flow are more quickly solved by taking the "long look" that high speed movies give you.

Champion Paper and Fibre Company engineers do this with a Kodak High Speed Camera. By filming a troublesome operation or process at 3200 pictures a second and then projecting the films at normal speed on a standard projector, action appears to slow down as much as 200 times. This often makes it possible to see exactly where the root of the trouble lies, and the films can be shown over and over again, stopped at critical points for detailed study and analysis.

With its Kodak High Speed Camera, Champion has studied the factors involved in the formation of a sheet of paper from a pulp suspension, investigated tests used to evaluate paper, studied mechanical problems connected with mill machinery.

Perhaps you have a high speed problem that has to be seen to be solved. Perhaps you find that "cut-and-try" experimentation is too time-consuming and costly. A Kodak High Speed Camera may be your answer. It has the right speed range for most industrial applications, is not too difficult to operate, uses regular 16mm movie film. To see how others have used it, send for our new booklet, "High Speed Motion Picture Making in Industry." Or write for details on a sound movie, "Magnifying Time."

Industrial Photographic Division
EASTMAN KODAK COMPANY, Rochester 4, N.Y.

the Kodak *HIGH SPEED* Camera

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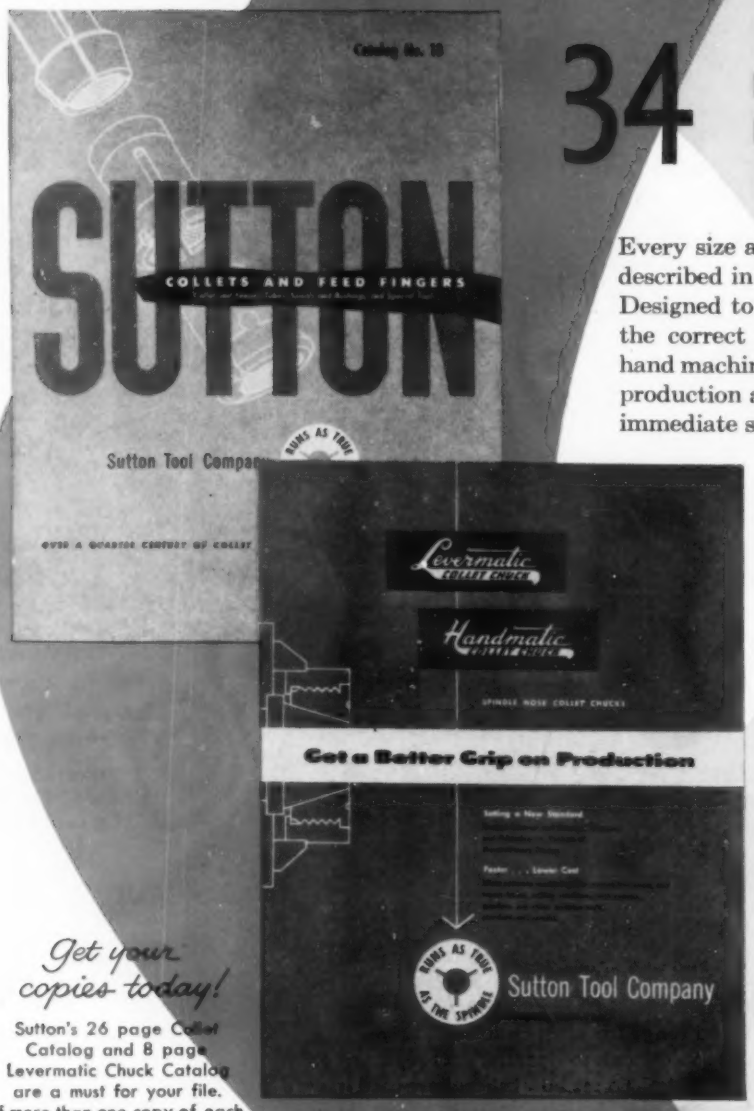
A Library of Collet and Chuck information



34 PAGE AUTHORITATIVE SOURCE FOR COLLET and CHUCK NEEDS

Every size and type collet and feeder is illustrated and described in Sutton's new comprehensive catalog. Designed to provide a quick and easy reference, it lists the correct collet, feeder and pad for automatics, hand machines, turret lathes, milling machines, production and engine lathes. Collets stocked for immediate shipment are keyed for easy identification.

Reasons why the Levermatic Spindle Nose Collet Chuck offers a new standard for positive gripping are explained in the new chuck catalog. Used on all machine tools, this popular chuck grips and releases *instantly* while machine is in constant operation, assuring continuous accuracy and uninterrupted production.

Get your copies today!

Sutton's 26 page Collet Catalog and 8 page Levermatic Chuck Catalog are a must for your file. If more than one copy of each is required, write on your company letterhead.

Sutton Tool Company, Dept. TE12, Sturgis, Mich.
Send free copies of Collet and Chuck Catalogs.

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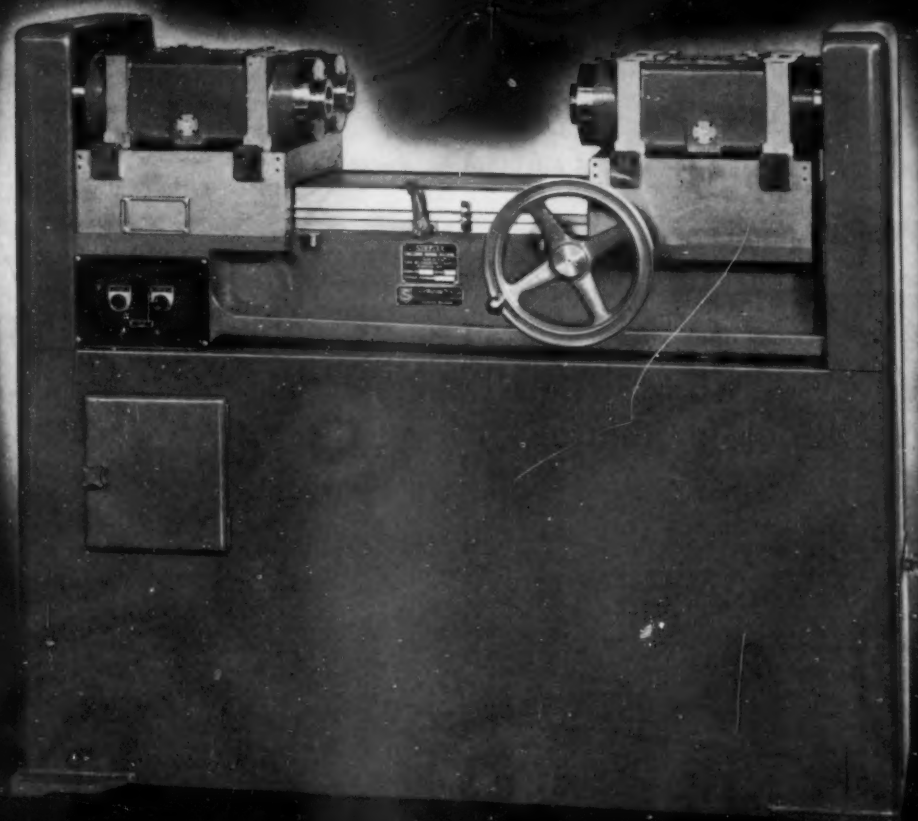
Simplex

PRECISION BORING MACHINES



Standard SIMPLEX 2LD3 Double End Mechanical Feed Precision Boring Machine with four ⌀3 SIMPLEX Precision Boring Heads. Other sizes of Mechanical and Unit Type Hydraulic Machines also available.

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SPECIAL DRILLING, TAPPING AND BORING MACHINES

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Time has certainly marched on since our first Bender was manufactured in 1893. Here, in contrast to a bathing suit of the same Horse and Buggy era, is a truly modern machine of our present day. PEDRICK PRODUCTION BENDERS are now used for cold bending pipe, tube, reinforcing bars, angles and many intricate structural shapes.

PEDRICK PRODUCTION BENDER prices start as low as $1575.00 for the model "A-3"

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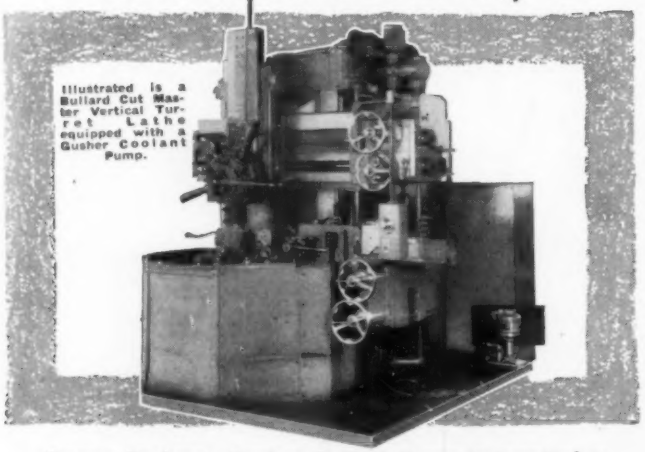
Low Cost Operation

is yours with a **RUTHMAN**

Gusher Coolant Pump



Once a Ruthman Gusher Coolant Pump is installed it requires little or no attention. The pre-lubricated heavy-duty ball-bearings require no further lubrication, there are no packing glands to adjust. The dynamically balanced rotating shaft minimizes vibration and wear. Minimum power is consumed when the Gusher is throttled down. You are sure of low cost operation when you specify Gusher Pumps on your machine.

THE RUTHMAN MACHINERY CO.

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MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

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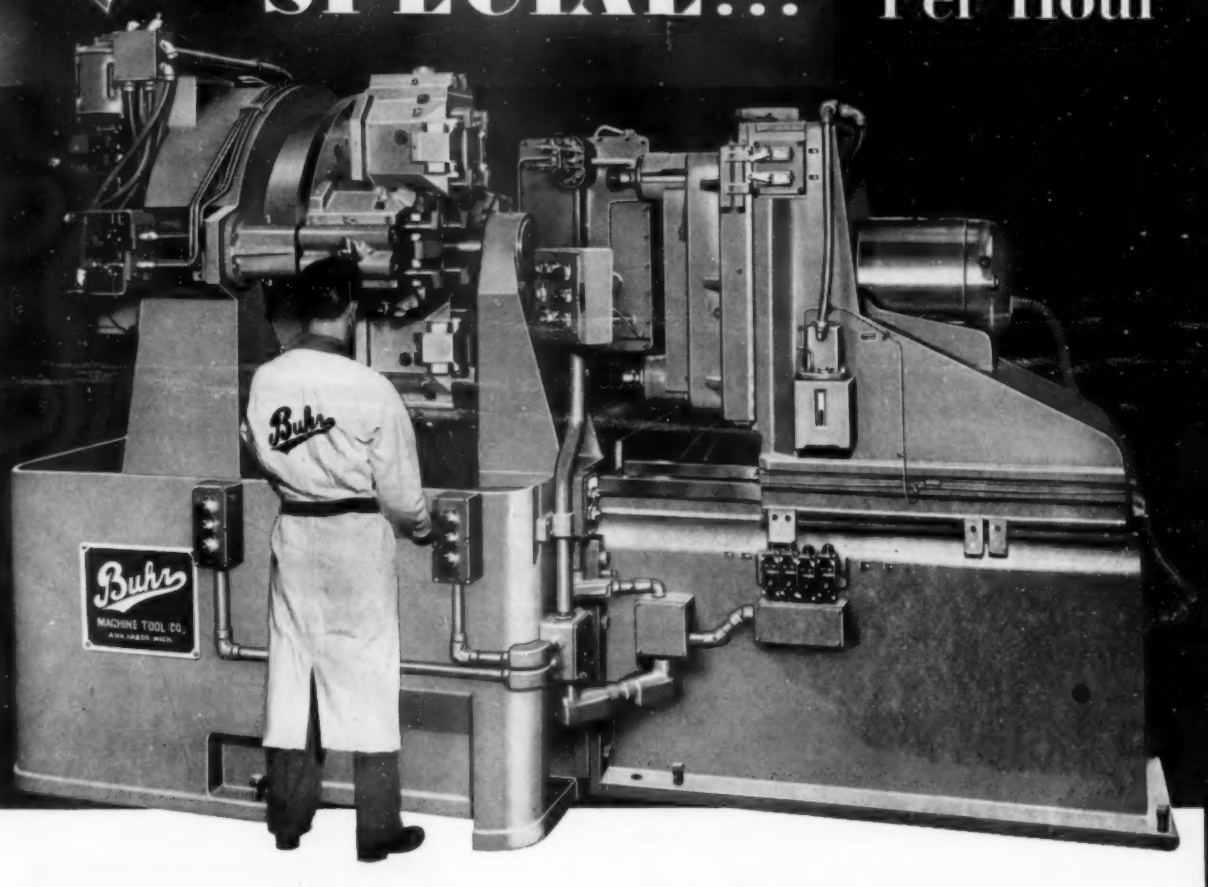
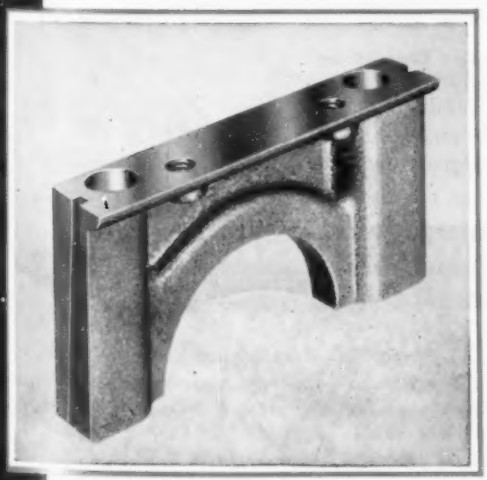
Buhr

SPECIAL...

Mills and taps 510 Oil Seal Retainers Per Hour





Fixture is arranged with hydraulically operated automatic clamping and automatic index.

Operation: Loading two parts. Station 1 — Load and Clamp.
Station 2 — Tap (2) 5/16-18 Holes and mill two Slots.
Station 3 — Idle.
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As with all Buhr Specials, fixtures are completely interchangeable, hydraulic and electrical installations to J.I.C. Standards, tool steel laminated, hardened and ground ways. Automatic lubrication throughout Machine.

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

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MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

FOR DRILLING, REAMING AND TAPPING

DRILL AND TAP CHUCKS

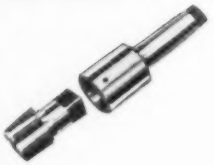
☐ **Style "B" Drill Chucks** for straight shank tools. Full range of standard chucks, with A.S.A. or Morse taper shank. Save tool costs by replacing taper shank drills with jobber length drills.

☐ **Style "A" Tap Chucks** give true collet action on tap shank. Speed tool changes; improve accuracy. High tensile strength.

☐ **Style "B" Center Drill Drivers,** with Morse taper shanks, in 15 sizes—⅛" x 3/64" to ¾" x 5/16" center drill size. Flutes drive off splined bore. Countersink hole protects drill tip.

TAP HOLDERS AND DRIVERS

☐ **Heavy-duty Tap Holders** drive large taps with ease; keep them running true. Broached square drive. Standard sizes for range of hand and pipe tap sizes, from ¾" to 3".



☐ **Close-center Tap Drivers** give maximum clearance between centers. Collet action minimizes strain, saves taps. Short, medium and long series convert spindles for most tapping needs.

☐ **Tension and Compression Tap Holders** compensate for variations between feed and tap pitch; protect machines and tools. Style "C" for feed less than tap lead; Style "D" for feed greater than lead.

☐ **Drill Stops** give positive, accurate control over depth of hole, stopping on work or fixture bushing. Eight standard sizes, with Morse taper shanks and hole diams. from ¼" to 1½".

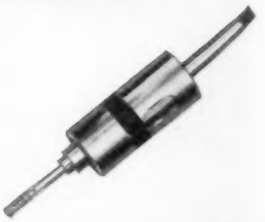
ADJUSTABLE ADAPTERS

☐ **Quick-lock Adjustable Adapters** permit fast, accurate depth adjustments in cluster of spindles. Maintain original accuracy of spindle when locked in place; speed tool changes. Standard sizes for most multiple-spindle tools.

☐ **Spindle Extension Assemblies,** for driving shank-type tools in multiple-spindle machines, accurately control depth of hole. Style 1800 for shank diams. from ¾" to 1⅞". Style 1900, from ⅝" to 1⅜".

FLOATING HOLDERS

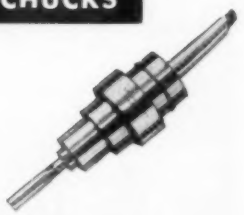
☐ **Style "JA"** gives free unrestricted float in all directions. Compensates for spindle or work misalignment; prevents tool breakage. A.S.A. or Morse taper collet; taper or threaded adapter shank.



☐ **Style "JT"** for multiple-spindle machines gives unrestricted float; permits accurate depth adjustment. Reduces scrap and tool breakage. Standard holders for most requirements.

QUICK-CHANGE CHUCKS

☐ **Quick-change Chucks** permit fast, easy tool changes without stopping machine. Increase production on single-spindle machines. Collets for A.S.A. or Morse taper shank.



SLEEVES, SOCKETS, TURRET TOOL HOLDERS

☐ **Style 100-D Precision Sleeves** reduce any A.S.A. or Morse taper hole to smaller taper. Hardened and ground. Style 100 "Use-Em-Up" Sleeves also available.

☐ **Style 100-W Extension Sockets** extend and convert spindles to larger or smaller taper. Short, medium and long series in standard sizes for most needs.

Precision Holding Tools do you need—

your cutting tools to the machine and the job?

CALL YOUR LOCAL SCULLY-JONES REPRESENTATIVE LISTED HERE!

FOR INTERNAL AND EXTERNAL CHUCKING OF PARTS AND TOOLS

"ROLL-LOCK" CHUCKING TOOLS

☐ **Flange-type Chucks** provide accurate, centering shrink fit by compressing holding surface. Quickly, easily operated by hand; 13 sizes, from ½" to 4" bore.

☐ **Style "K" Expanding Mandrels** available in 5 standard sizes, from ½" to ¾" dia. Style "B" in 13 sizes, from 13/16" to 2¼" dia. Style "J," 6 sizes, from 2½" to 4½" dia.

☐ **Expanding Mandrels** for tool room grinding: 8 sizes, from ⅛" to 2" dia.

☐ **Flange-type Expanding Arbors:** 23 sizes, from ½" to 4" dia.

☐ **Expanding Milling Arbors** have N.M.T.B. taper shanks; 8 sizes, from ¾" to 2" dia.

☐ **Tool Chucks:** variety of sizes and shank styles available.

FOR MILLING

ARBORS AND ADAPTERS

☐ **Style "A" Arbors,** with pilot end support, for machines with National Standard spindle end and nonsticking 3½" per foot taper hole. Range of sizes; 40 and 50 N.M.T.B. standard tapers.

☐ **Style "B" Arbors,** without pilot. Available in range of sizes with 40 and 50 N.M.T.B. standard tapers.

☐ **Shell End Mill Arbors** available in range of sizes and styles. Collet Holders, Cutter Shank Adapters, Centering Plugs, and other Adapters available to meet your needs.

☐ **Solid Spacing Collars** have faces lapped parallel within .0002"; keep cutters running true. Many standard sizes, from .006" to 6" thick, ⅞" to 2½" bore.

☐ **Arbor Bearing Sleeves** for standard "A" and "B" size arbors. Bore and O.D. within .0005", faces within .0002"; ⅞" to 2½" bore size.

☐ **Adjustable Spacing Collars** quickly, easily give odd decimal lengths between cutters; 7 sizes, from ¾" to 2½" bore.

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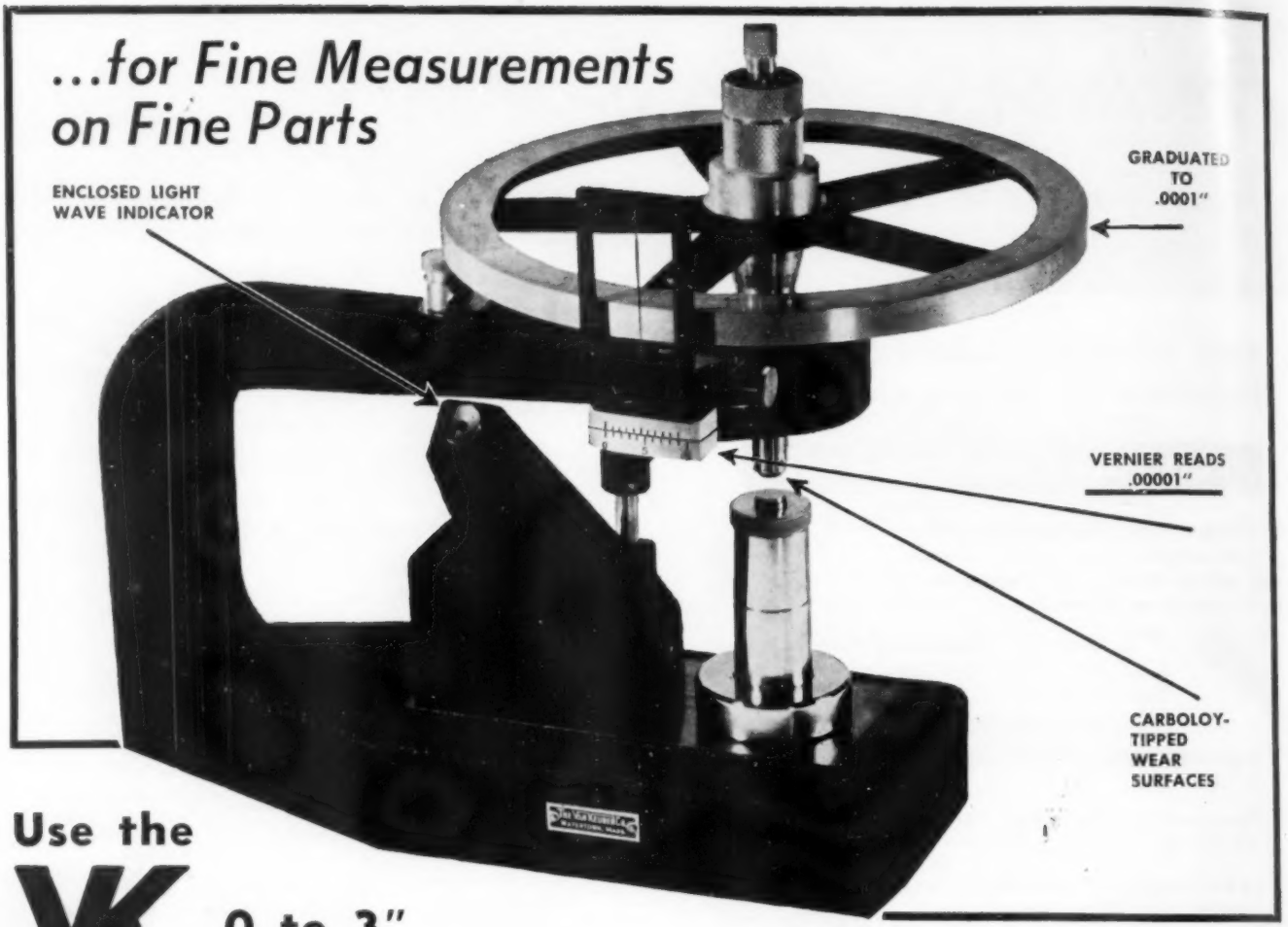
Scully-Jones and Company, 1915 South Rockwell St., Chicago 8, Ill.

...for Fine Measurements on Fine Parts



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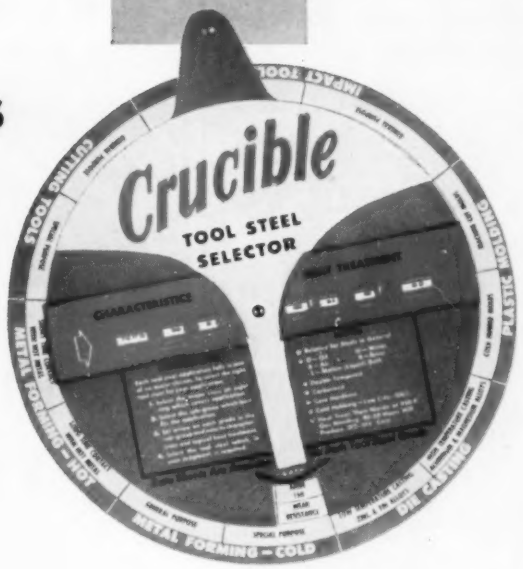

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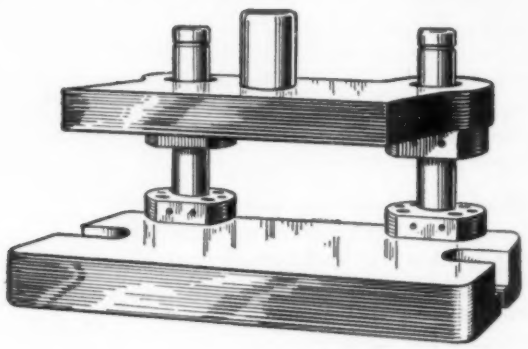

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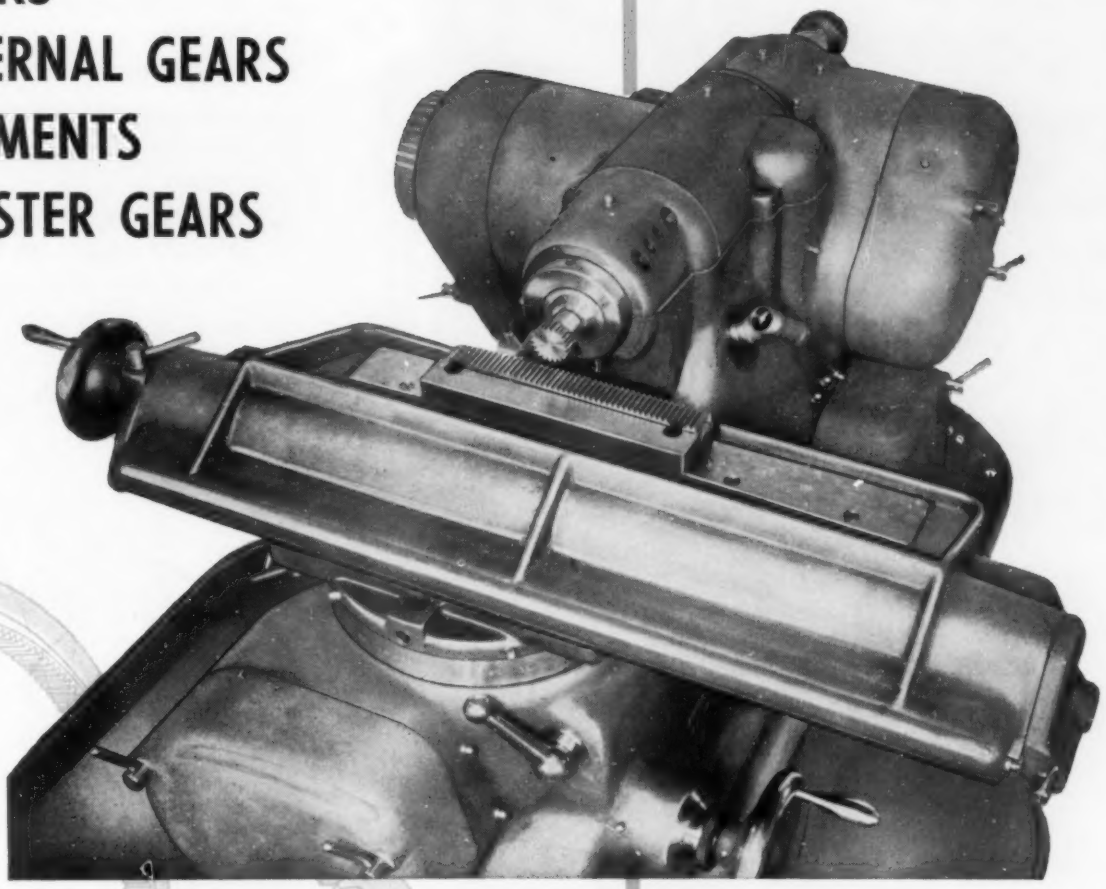

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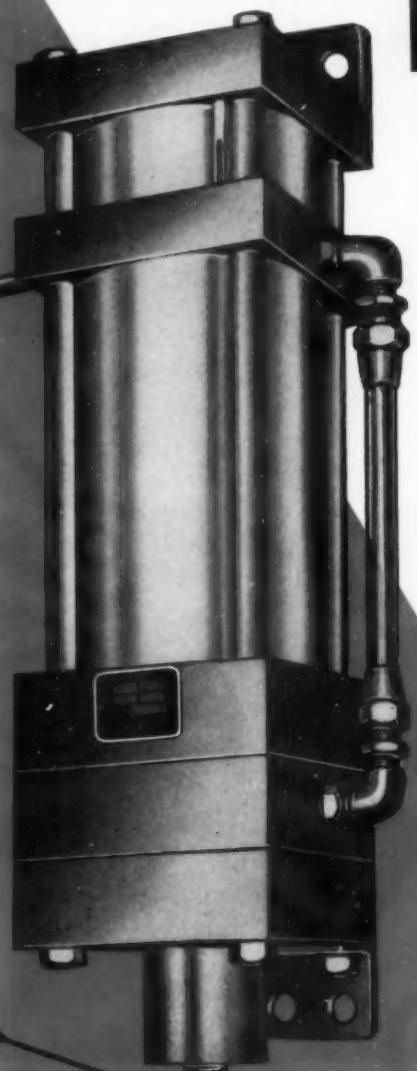

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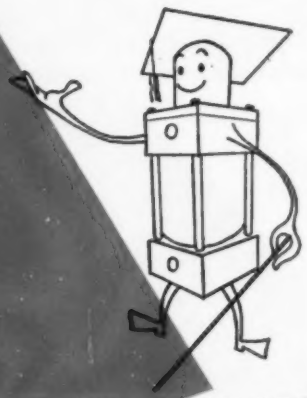

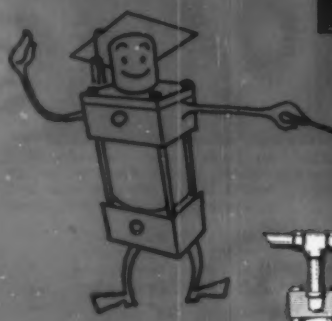

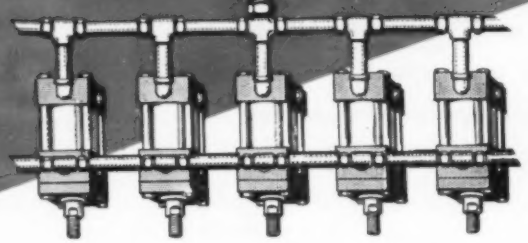

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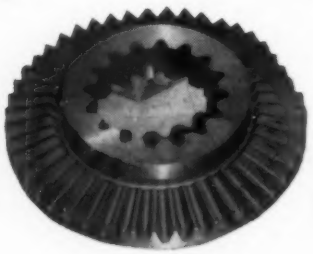

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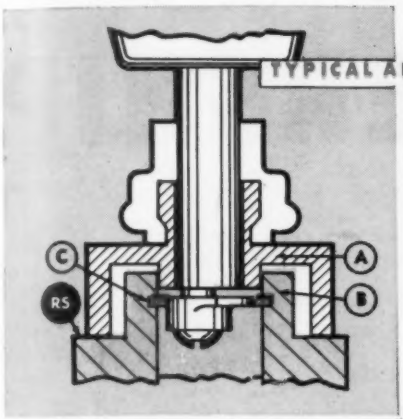
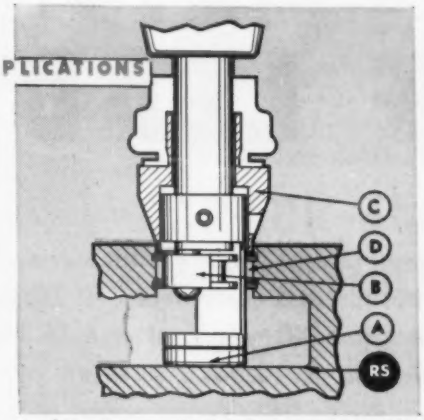
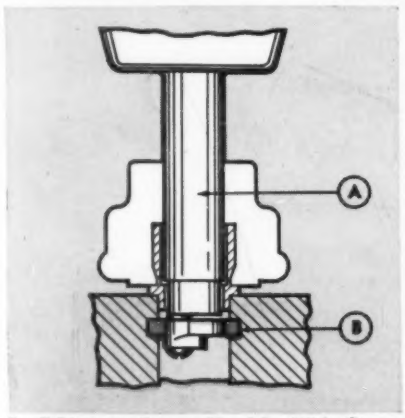


Clearing Obstructions or Protrusions — Waldes Truarc Grooving Tool with *special bushing* with high shoulder A in order to clear obstruction B on reference surface RS so groove can be properly located in bore.



Locating Grooves from Bottom of Hole or Blind Hole—Use of *bottom adaptor* A and double cutter B. Bushing C pilots tool into bore D while bottom adaptor acts as stop to locate grooves from reference surfaces RS below bore.



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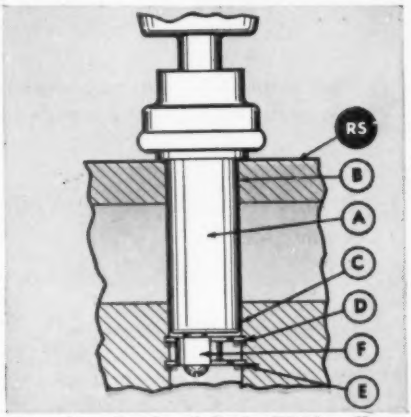

Extending Reach of Tool — Waldes Truarc Grooving Tool assembled with *extended bushing* A increases normal range of tool in order to reach proper groove location in bore. Bushing also registers on reference surface RS of workpiece while piloting tool at two points B and C inside bore. Two grooves D and E are cut simultaneously with double cutter F.

AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

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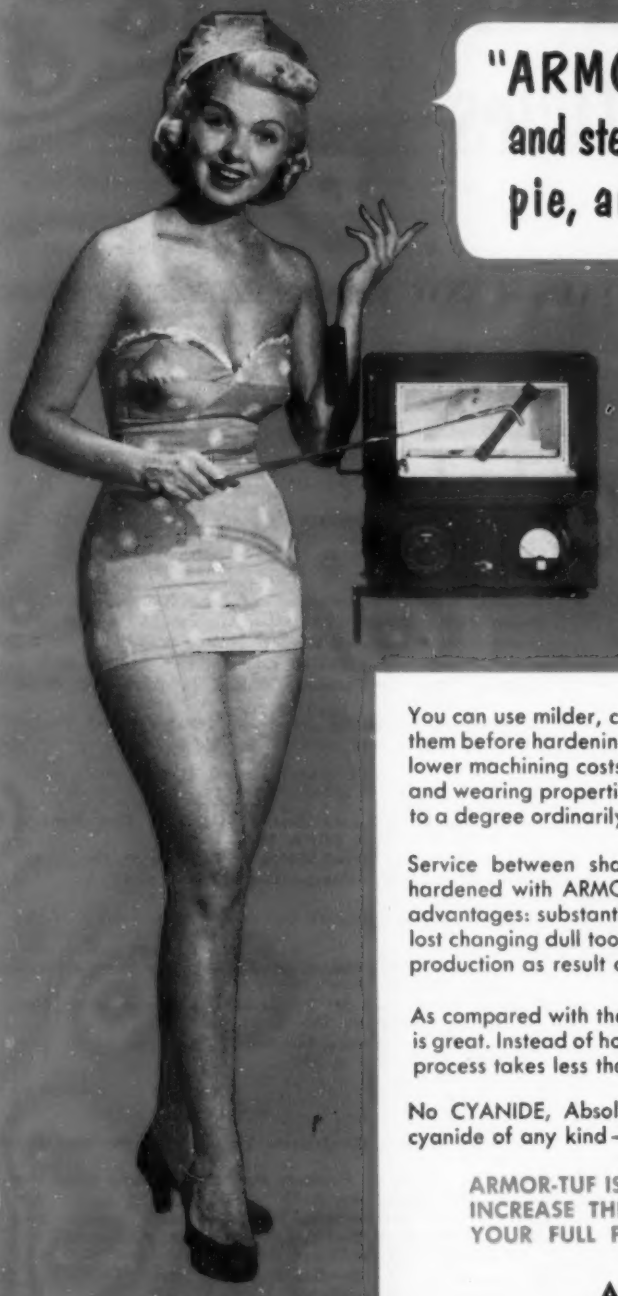

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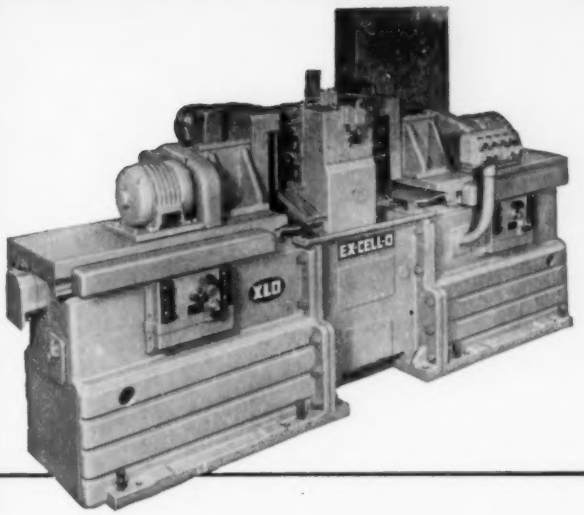

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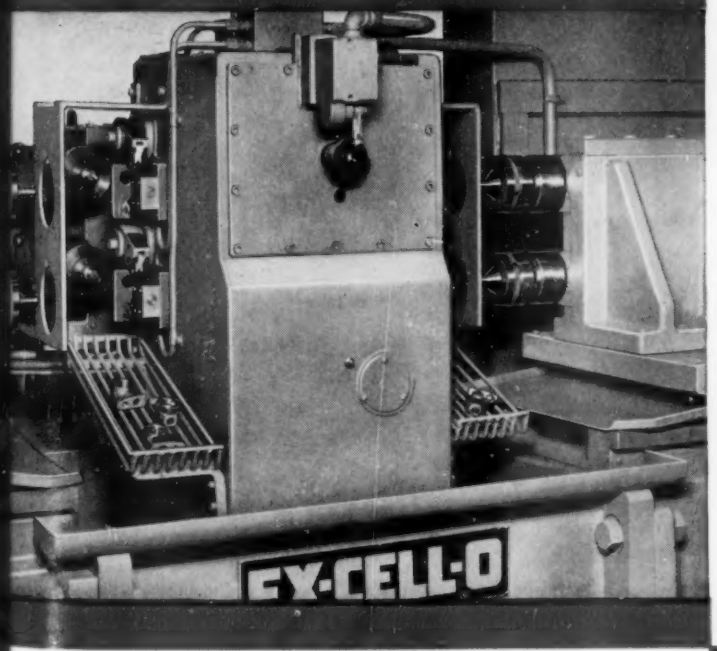

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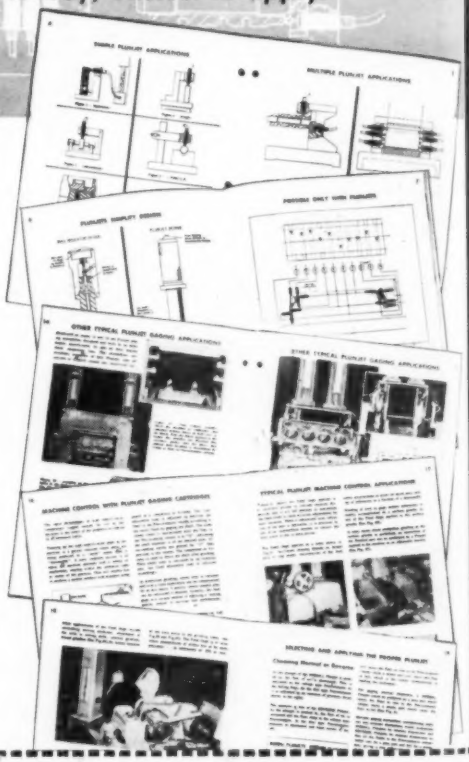

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